

**MINISTRY OF INFRASTRUCTURE, PUBLIC WORKS  
AND RECONSTRUCTION  
DEMOCRATIC REPUBLIC OF THE CONGO**

**Project for Urban Transport Master Plan  
in  
Kinshasa City  
-PDTK-**

**FINAL REPORT**

**Volume 2: Pre-F/S of University Avenue  
(Section A: Sendwe IS - RP Ngaba)**

**April 2019**

**JAPAN INTERNATIONAL COOPERATION AGENCY  
(JICA)**

**ORIENTAL CONSULTANTS GLOBAL CO., LTD.  
INGEROSEC CORPORATION  
YACHIYO ENGINEERING CO., LTD.  
ASIA AIR SURVEY CO., LTD.**

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**Final Report: Volume 2**  
**Pre-feasibility Study on University Avenue**  
**- Section A (Sendwe IS – RP Ngaba)**

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## General Abbreviations

No.	Abb.	English	French
1	AAGR	Annual Average Growth Rate	Taux de Croissance Annuel Moyen (TCAM)
2	AASHTO	American Association of State Highway and Transportation Officials	Association des routes nationales et des directives de transport aux Etats-Unis
3	ACCO	Association of Congo Drivers	Association des Chauffeurs du Congo
4	ACE	Congolese Environment Agency	Agence Congolaise de l'Environnement
5	ACGT	Congolese Agency of Great Works, MITPR	Agence Congolaise des Grands Travaux, MITPR
6	ACT	Articulated Truck	Camion articulé
7	AFD	French Development Agency	Agence Française de Développement
8	APVCO	Association of Public Transport Vehicles Owners	Association des Propriétaires de Véhicules Privés Affectés au Transport en Commun
9	C/S	Construction Supervision	Supervision de Construction
10	CDF	Congo Franc	Franc Congolais
11	CI	Infrastructure Unit, MITPR	Cellule Infrastructures, MITPR
12	CIF	Cost Insurance and Freight	Coût, assurance et fret
13	D/D	Detail Design	Coception détaillée
14	DBST	Double Bituminous Surface Treatment	Traitement de surface avec une double couche d'asphalte
15	DRC	Democratic Republic of the Congo	République Démocratique du Congo
16	E/N	Exchange of Notes	Echange de notes
17	EIA	Environmental Impact Assesment	Évaluation d'Impacts Environnementaux
18	ESIA	Environmental and Social Impact Assessment	Évaluation d'Impacts Environnementaux et Sociaux
19	F/S	Feasibility Study	Étude de Faisabilité
20	GIS	Geographic Information System	Système d'Information Géographique
21	GRDP	Gross Regional Domestic Product	Produit Intérieur Brut Régional
22	HGT	Heavy Goods Truck	Camion de Marchandises Lourdes
23	IEE	Initial Environmental Examination	Examen Environnemental Initial
24	IS	Intersection	Intersection
25	JICA	Japan International Cooperation Agency	Agence de Coopération Internationale du Japon
26	JPY	Japanese Yen	Yen japonais
27	KV	Kilo Volt	Kilovolt
28	LAP	Land Acquisition Plan	Plan d'Acquisition de Terrains
29	LGT	Light Goods Truck	Camion de marchandises légères
30	LHS	Left Hand Side	Côté gauche
31	NMT	Non-Motirized Transport	Transport Non Motorisé
32	ODA	Official Development Assistance	Aide au Public Développement
33	OR	Road Agency, MITPR	Office des Routes, MITPR
34	OVD	Office of Roads and Drainage, MITPR	Office des Voiries et Drainages, MITPR
35	PCU	Passenger Car Unit	Unité de Voiture Particulière
36	Pre-F/S	Preliminary Feasibility Study	Étude de Préfaisabilité
37	RAP	Resettlement Action Plan	Plan d'action de réinstallation
38	REGIDESO	Waterworks Bureau	Regie de Distribution d'Eau
39	RHS	Right Hand Side	Côté droit
40	ROW	Right of Way	Droit de passage

No.	Abb.	English	French
41	RP	Roundabout	Rond-point
42	SEA	Strategic Environmental Assessment	Évaluation Environnementale Stratégique
43	SL	Screen Line	Comptages par lignes écrans
44	SNEL	National Electricity Society	Société Nationale d'Electricité
45	SOSAK	Strategic Orientation Scheme for the Kinshasa Metropolitan Area	Schéma d'Orientation Stratégique de l'Agglomération Kinois
46	TAZ	Traffic Analysis Zone	Zone d'Analyse du Trafic
47	USD	United States Dollar	Dollar américain
48	VAT	Value Added Tax	Taxe sur la valeur ajoutée
49	VOT	Value of Time	Valeur des temps
50	WB	World Bank	Banque mondiale

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# **SUMMARY**

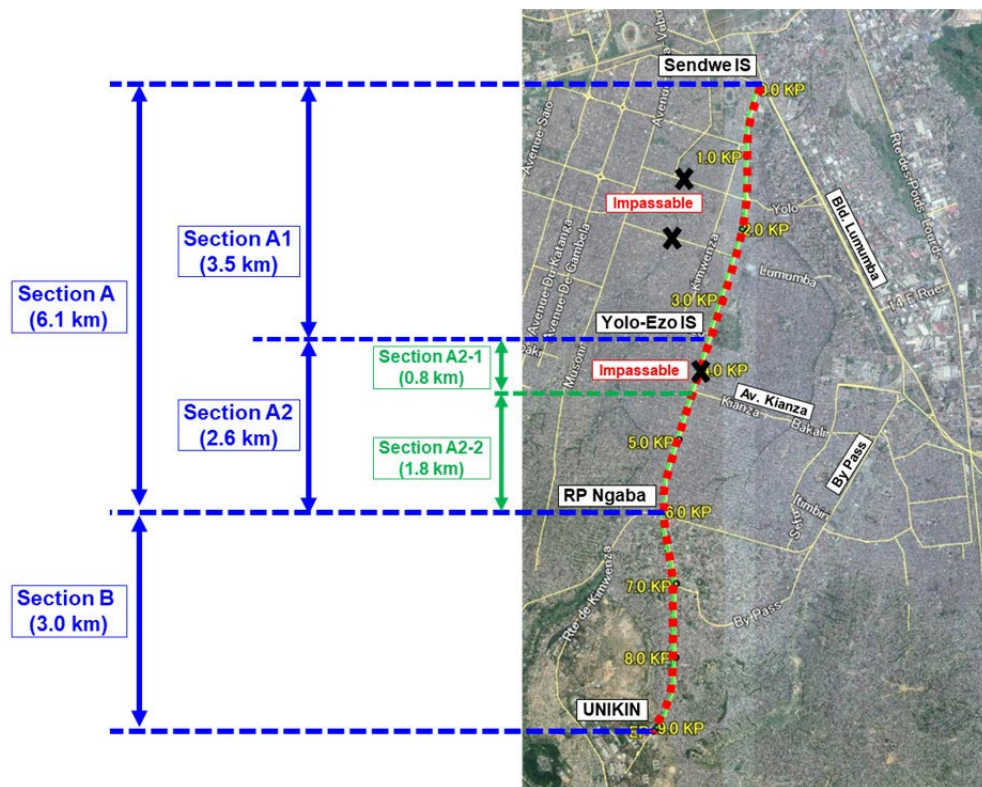
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# 1 Introduction

## 1.1 General

The Study Report consists of three volumes. Volume 1 deals with the Urban Transport Master Plan in Kinshasa City corresponding to the overall JICA Study Phase 1: Analysis of Current Conditions and Phase 2: Formulation of Urban Transport Master Plan. Volume 2 and Volume 3 deals with Phase 3: Preliminary Feasibility Study on University Avenue (Pre-F/S).

Volume 2 covers the section from Sendwe IS (Sendwe Intersection) to RP Ngaba (*Rond-Point Ngaba* / Ngaba Roundabout) on University Avenue, namely Section A, and, Volume 3 covers the section from RP Ngaba to University of Kinshasa, namely Section B. The section setting of this Volume 2 and Volume 3 is illustrated in Figure 1.1.



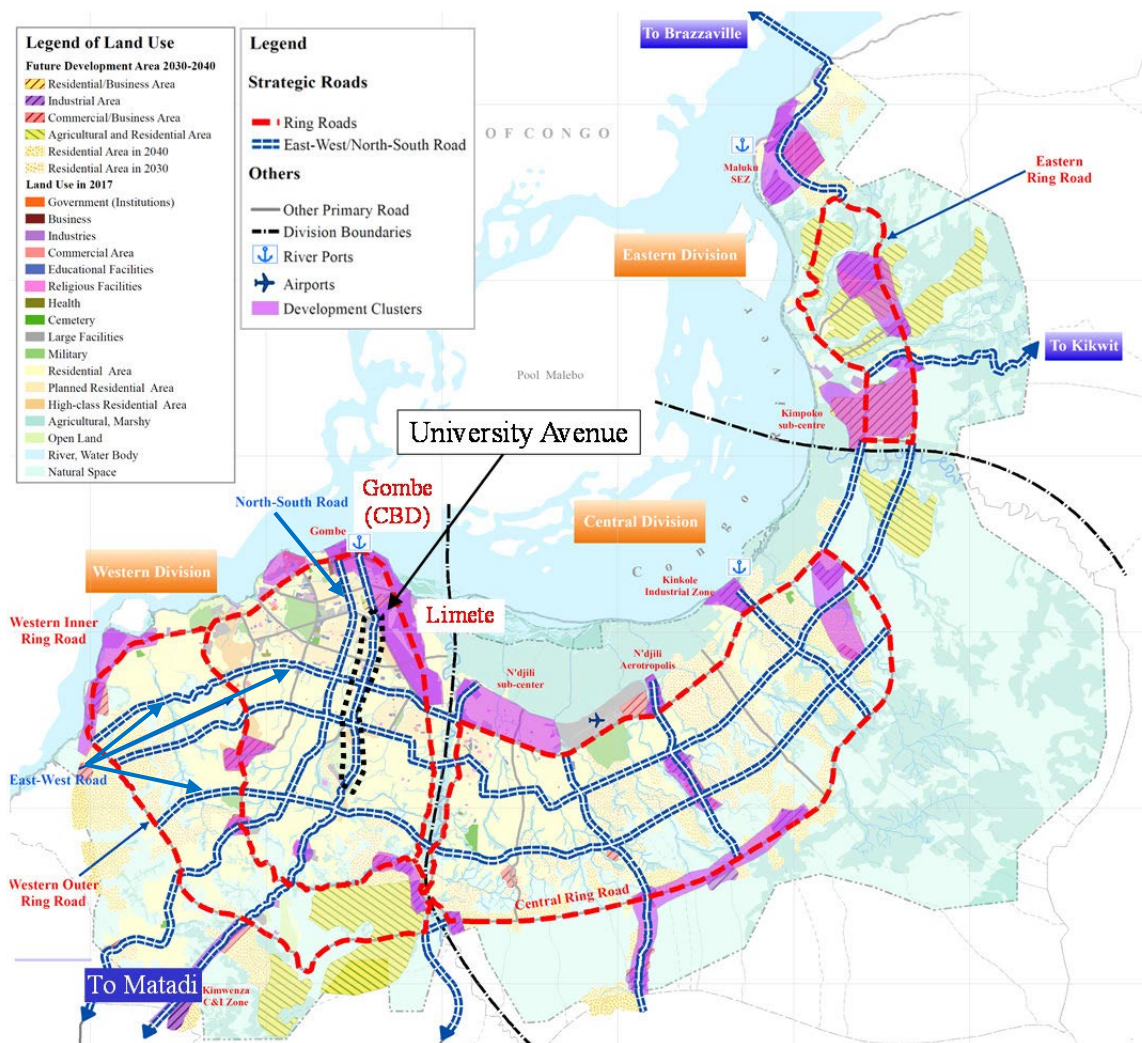
Source: Google, Digital Globe taken on the 6th March, 2018, edited by the Study Team

**Figure 1.1 Section Setting of Section A and B**

## 1.2 Background and Objectives

The Urban Transport Master Plan aims to attain four objectives by implementing nine policies. ‘Network development of trunk roads and transits’ is one of the nine key policies, and it proposes a hierarchical road network system including primary, secondary, tertiary and local roads.

Among primary roads, the strategic roads are defined as roads serving heavy and long-distance transport. Since University Avenue connects the CBD, industrial zones in Limete and the southern area of the Study Area as well as the international ports of Matadi, Boma and Banana, it is categorized as the north-south direction strategic road to form part of the backbone road network as shown in Figure 1.2. It is noteworthy that University Avenue will serve not only for local activities along the University Avenue but also for national-level passengers and cargo transport.



Source: The Study Team

Figure 1.2 Proposed Strategic Road Network in the Study Area



Considering the important functions of University Avenue as a strategic road, the improvement of the existing road to a 4-lane road is proposed by the year 2030. Additionally, it should be noted that University Avenue is planned to serve as a bus rapid transit (BRT) route in 2030. Since the University Avenue is planned to be a 4-lane road, the open system BRT, which does not have an exclusive lane for BRT, is proposed for the year 2030.

Some sections of University Avenue reserve enough open space to realize the 4-lane road construction. Therefore, the time required to relocate buildings in those sections can be minimized and easier implementation of the project will benefit not only the residents along University Avenue but also those in the Study Area, eventually.

Therefore, University Avenue was selected as the priority project of Pre-F/S to realize “Enhancement of Mobility Function of Road Network” (project ID: RD-ST-PR2) among the 5 short-term projects in the road sector, which are described in Volume 1 of the Study Report.

### **1.3 Contents of the Report**

Volume 2 of the Draft Final Report consists of 8 Chapters, focusing on a Pre-F/S on the development of Section A (Sendwe IS – RP Ngaba) of University Avenue. Contents of the Volume 2 are listed below;

- Chapter 1: Introduction
- Chapter 2: Transport Survey and Transport Demand Projection
- Chapter 3: Setting and Comparison of Alternatives
- Chapter 4: Approach on Facility Design and Basic Design
- Chapter 5: Outline Project Cost
- Chapter 6: Financial Burden on DR Congo Side
- Chapter 7: Environmental and Social Considerations
- Chapter 8: Toward Implementation

It should be noted that a Pre-F/S has been carried out under the assumption that the improvement of University Avenue will be implemented with Japanese grant aid; however, nothing in this Study Report should be understood as implying a commitment of JICA or the Government of Japan to a provision of a grant aid.

## **2 Current Conditions of University Avenue**

### **2.1 Introduction**

To date, there exist only three north-south direction routes connecting CBD and the national road toward Matadi (the N1 Road). They are Liberation Avenue, Lumumba Boulevard linked to Bypass Avenue and L. Desiré Kabila Avenue (Route de Matadi), and they lie in parallel at about 6km away from each other. Despite a strategic role of University Avenue as the north-south connection in the Master Plan, it is not fully functioning at present due to collapsed pavement, large scale pit holes and inundation of sewage water as shown in Figure 2.1.



Water ponding in the existing road at around PK2.0 km

Water ponding with debris in the existing road at around PK4.0 km

Source: The Study Team

### Figure 2.1 Current Road Situation of University Avenue

Since University Avenue is heavily damaged and impassable, vehicles from the south western direction, such as trucks from Matadi Port, have to detour to either the route via Liberation Avenue or the other route via Bypass Avenue and Lumumba Boulevard. Significant reduction of travel time can be expected by improving University Avenue and eventually connecting smoothly to Bypass Avenue for vehicle transport. It also contributes to alleviate the traffic congestion of Bypass Avenue and Lumumba Boulevard.

## 2.2 Roadside Situation

Several large public facilities are located along University Avenue such as a stadium, universities and transport terminals and thus the bus route 19A had been operated by Transco. However, it has been suspended because of the impassable road conditions of University Avenue.

It also should be noted that areas along University Avenue accommodate a large number of the population. Approximately, 802,000 people reside, and 117,000 people work<sup>1</sup> in, the 1km width of land along the section between Sendwe Intersection (Sendwe IS) and Rond-Point Ngaba (RP Ngaba/ Ngaba Roundabout) of University Avenue.

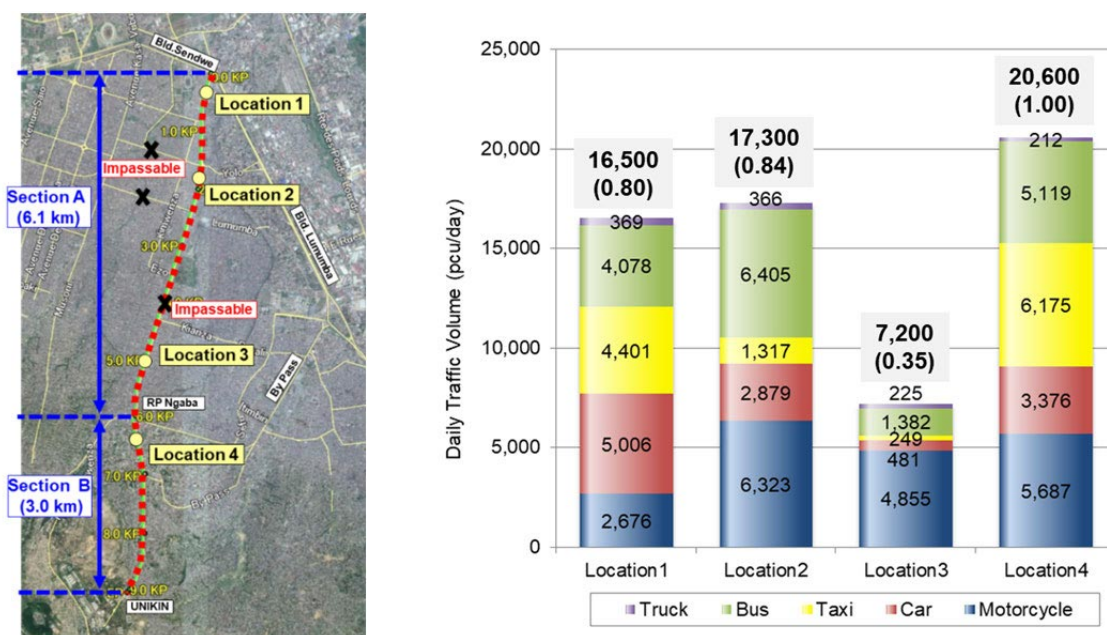
## 2.3 Daily Traffic Volume

As shown in Source: Google, Digital Globe taken on the 6th March, 2018, edited by the Study Team

Figure 2.2, daily traffic volumes in 2018 of locations 1, 2 and 3 are 16,500 pcu/day, 17,300 pcu/day, and 7,200 pcu/day, respectively. Despite little through-traffic on Section A, traffic volume at locations 1 and 2 almost reach the capacity of the 2-lane road (20,500 pcu/day, refer to Section 2.2 of Volume 1 of the Study Report). It is therefore assumed that the traffic volume in Section A could have exceeded the capacity of the 2-lane road, if Section A of University Avenue was fully operational in 2018. On the other hand, the daily traffic volume of location 4 already exceeds the capacity of the 2-lane road and it will further increase due to population growth and land development in the future.

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<sup>1</sup> Estimates by the Study Team based on the Commuter Survey in 2017



Note: The daily traffic volume was estimated based on traffic count survey results in 2018 and traffic volume ratio of 15 hour and 24 hour durations observed at a point on Lumumba Boulevard in 2017.

The figure in the parentheses indicates the congestion rate derived from daily traffic volume and road capacity.

Source: Google, Digital Globe taken on the 6th March, 2018, edited by the Study Team

Figure 2.2 Daily Traffic Volume and Congestion Rate (Year 2018)

### 3 Alternative Typical Cross Sections

#### 3.1 Setting of Alternative Cross Sections

The carriage-way of the project road is recommended to be 4-lane in both directions in 2030 in the Master Plan. However, if the 4-lane carriage-way is fully implemented throughout the road, certain sections of the road will have quite a large negative impact on shops and residential buildings located along the narrow and densely developed sections. As such, some sections will have to be constructed as the 2-lane road.

Based on the above-mentioned land availability and geometric standard as described in Chapter 3 of main text, options of the alternative typical cross sections were proposed as shown in Table 3.1.

**Table 3.1 Options of Alternative Typical Cross Sections**

Option No.	Road Width of Section A (BP - PK6.1 km)		Remarks
	A-1 (BP - PK3.5 km)	A-2 (PK3.5 - PK6.1 km)	
1	31.5 m	31.5 m	4-lane in whole section.
2	24 m	24 m	4-lane in whole section.
3	17 m	17 m	4-lane in whole section.
4	15 m	15 m	2-lane in whole section.
5	13.5 m	13.5 m	2-lane in whole section.
6	10.5 m	10.5 m	2-lane in whole section.
7	31.5 m	15 m	Combination with 4-lane and 2-lane
8	31.5 m	13.5 m	Combination with 4-lane and 2-lane
9	31.5 m	10.5 m	Combination with 4-lane and 2-lane

Source: The Study Team

### 3.2 Key Indicators for the Comparison

Comparison of optional project configurations was undertaken based on four key indicators using available data at the moment and results of field surveys. The selected indicators are: 1) Projected Traffic Demand, 2) Project Cost, 3) Environmental Category, and 4) Cost borne by the DRC Government. Details of each key indicator are described in the relevant chapters as introduced below:

- Projected Traffic Demand (Refer to Chapter 2 of Main Text)
- Project Cost (Refer to Chapter 5 of Main Text)
- Environmental Category (Refer to Chapter 7 of Main Text)
- Costs borne by the DRC Government (Refer to Chapter 6 of Main Text)

### 3.3 Comparison of Optional Project Configurations

Based on the key indicators and section settings mentioned above, multi-criteria comparison has been made among the optional project configurations. The summary of findings according to the indicators is as follows:

- Projected daily traffic volumes of Section A1 in 2024 range from 48,000 to 64,000 pcu/day for 4-lane option, from 28,000 to 42,000 pcu/day for 2-lane option, and from 46,000 to 59,000 pcu/day for the combination of 4-lane and 2-lane options. The traffic volume of Section A2 is estimated to be around 50,000 pcu/day for the 4-lane option, 28,000 to 33,000 pcu/day for the 2-lane option, and around 34,000 pcu/day for the combination of 4-lane and 2-lane options. The projected traffic volume of all the options will exceed their road capacity even in the

opening year of 2024.

- Considering the high transport demand and important functions of University Avenue as a backbone transport network in the Study Area, early project implementation is preferable. In case 4-lane option requires long periods due to large scale of land acquisition and financial constraints, the 2-lane option is considered as a feasible option to connect the current missing link and avoid further traffic congestion. In addition, additional countermeasures are essential to alleviate traffic congestion, such as road widening, development of other north-south roads, and a promotive policy of modal shift from private mode to public transport.
- The preliminary cost estimates of 4-lane options are 52.3 million USD for option 1 (31.5m width), 44.5 million USD for option 2 (24.0 m width) and 42.2 million USD for option 3 (17.0 m width). Those of 2-lane options are 38.5 million USD for option 4 (15.0 m width), 37.1 million USD for option 5 (13.5 m width) and 33.2 million USD for option 6 (10.5 m width). Those of the combination of 4-lane and 2-lane options are 44.1 million USD for option 7 (31.5 m+10.5 m widths), 39.6 million USD for option 8 (24.0 m+10.5 m widths) and 38.4 million USD for option 9 (17.0 m+10.5 m widths).
- Considering the affected areas along University Avenue, option 1 and 2 are deemed as “Category A”, option 3, 4 and 5 are deemed as “Category A or B”, and Option 6, 7, 8 and 9 are deemed as “Category B”, in accordance with JICA Guidelines for Environmental and Social Considerations (April 2010). It should be noted that this is a preliminary estimation based on counting the likely structures affected by the project using the satellite imaginary. Thus, it is necessary to conduct topographic survey and EIA study to identify accurate environmental category. At this moment, Category B option is preferable from the view point of early project implementation.
- In terms of the cost borne by the DRC government, preliminary cost estimations of 4-lane options are 21.9 million USD for option 1, 9.45 million USD for option 2 and 2.48 million USD for option 3. The costs of 2-lane options are 1.43 million USD for option 4, 1.01 million USD for option 5 and 0.70 million USD for option 6. The costs of the combination of 4-lane and 2-lane options are 1.88 million USD for option 7, 1.24 million USD for option 8 and 0.76 million USD for option 9. The comparison result indicates that a huge amount of the costs of 4-lane options will be brought about by the land acquisition cost and compensation cost of Section A2.

## **4 Toward Implementation**

### **4.1 Expected Impacts**

Various positive and negative impacts of the projects are expected. Expected impacts are described from the viewpoints of four objectives of the urban transport; namely 1) Supporting Urban Economic Activities, 2) Assuring Equity in Transport, 3) Improving Safety and Security, and 4) Achieving Environmentally Sustainable Transport as discussed in Chapter 7 of Volume 1. As the analysis below is qualitative, quantitative analysis on impacts of the project should be conducted during the feasibility study phase.

From an economic perspective, connection of CBD and the national road toward Matadi (the N1 Road) by University Avenue will significantly reduce the travel time of both passenger and cargo

transport as vehicles currently have to detour either the route via Liberation Avenue or the other route via Bypass Avenue and Lumumba Boulevard. University Avenue will play a key role as a strategic road of the Master Plan.

Medical, educational and recreational facilities are located along University Avenue. In terms of equity in transport, the project will improve accessibility to those facilities accommodated with the road-cum-pedestrian path. Bus routes on University Avenue, which are currently not operated, will also improve the access of people without private vehicles. Residents along University Avenue will have motorized transport access to various urban functions such as employment, educational service, medical service and business opportunities, etc. Approximately, 802,000 people reside, and 117,000 persons work in, the 1km width of land along the section between Sendwe IS and RP Ngaba of University Avenue.

In general, reduction of traffic accidents can be expected with appropriately designed roads without potholes and substandard pavements. However, there is a risk of an increase of traffic accidents especially during the night time due to speeding as the planned road has smooth pavement and relatively straight alignment. Improvement of road safety equipment and facilities targeting speeding vehicles such as speeding enforcement cameras together with strict law enforcement can alleviate these negative impacts.

The expected environmental impacts will be limited to the standard and typical impacts usually observed during road construction works and the operation phase of the improved roads. Impacts from land acquisition and resettlement necessary to implement the Project will be quite large depending on the final selection of ROW width as shown in Table 6.2.1 to Table 6.2.6 in the main text. Thus, land acquisition and resettlement should be conducted following international standard such as JICA's Guideline.

## **4.2 Project Schedule prior to the Project Implementation**

In the event where the Project is implemented under the Japan's Grant Aid Scheme, the draft schedule for outline design and detailed design is discussed in Chapter 8 of the main text. The estimated entire schedule up to the implementation is approximately 23.0 months, comprising approximately 12.0 months for outline design including authorized processing such as E/N and G/A and 9.0 months for detailed design.

## **4.3 Process of Land Acquisition, Relocation, Resettlement and Rehabilitation**

The process of land acquisition, relocation, resettlement and rehabilitation is expected to be the same as the Congo-Japon Boulevard Project. It will be necessary that a project-specific Decree is issued by the Minister of Infrastructure, Public Works and Reconstruction. Then, based on the Decree, the commission for the evaluation of concessions and buildings in the land required by the University Avenue Project will be established either for each Quartier or for all the affected Quartiers.

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# MAIN REPORT

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## CHAPTER 1 Introduction

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### 1.1 Background and Objectives

#### 1.1.1 Background of the Study<sup>1</sup>

The population of Kinshasa City, the capital of the Democratic Republic of the Congo (hereinafter abbreviated as DRC), has increased from around 2.6 million<sup>2</sup> in 1984 to 10.6 million<sup>3</sup> in 2013 at an average annual growth rate of 4.9% and it is expected to reach around 20 million<sup>4</sup> in 2030 and 26 million<sup>3</sup> in 2040 at the annual growth rates of 3.8% between 2013 and 2030 and 2.7% between 2030 and 2040, respectively.

Twenty-one communes out of the total twenty-four communes in Kinshasa City are urbanized in terms of such land uses as CBD (Central Business District), commercial, industrial or residential areas where the population density exceeds over 200 persons per hectare in 2013. The urbanized commune area totals about 327 km<sup>2</sup>, which accounts for only 3.1% of the entire area of Kinshasa City that is 10,667 km<sup>2</sup>. Meanwhile, the population of the urbanized communes dominates 82.1% of the total Kinshasa City population and they are concentrated excessively to densely built-up communes of over 500 persons/ha, such as Bumbu (1,181 persons/ha), Ngaba (902 persons/ha), Matete (688 persons/ha), N'djili (619 persons/ha), Makala (590 persons/ha) and Ngiri-ngiri (572 persons/ha) in 2013.

Despite the rapid urbanisation of Kinshasa City, current infrastructure development is still insufficient as 80% of total road length still remains unpaved under the jurisdiction of OVD (*Office des Voiries et Drainage* / Office of Roads and Drainage). Among the four major arterial roads, Boulevard Lumumba, Congo-Japan Boulevard (*Avenue de Poids Lourds*), Matadi Avenue and 30th June Avenue, the heaviest traffic volume, counted as 35,749 vehicles/12 hours, was observed with frequent traffic congestions on 30th June Avenue. Ordinary bus transport is not well managed since mixed operation of public, private and owner-driven buses prevails, though it was a major means of transport about a decade ago. In addition, the existing three urban railway lines, beginning from the central station toward Kintambo/Kinsuka (West line), Matadi (South line) and the airport (East line), are hardly used. Currently, only a few operations are maintained on the South and East lines in the morning and afternoon due to degradation of the tracks, whereas the West line has stopped its operation at present.

Under the above-mentioned circumstances, SOSAK (*Schéma d'Orientation Stratégique de l'Agglomération Kinois* / Strategic Orientation Scheme for the Kinshasa Metropolitan Area) has been formulated and formally approved by the provincial congress in 2015 to promote the planned urban development of Kinshasa City with the support of AFD (*Agence Française de Développement* / French Development Agency) which calls for the necessity of Urban Transport

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<sup>1</sup> “The Study” in this report means all the studies conducted by the Project for Urban Transport Master Plan in Kinshasa City / PDK.

<sup>2</sup> Census data in 1984

<sup>3</sup> The estimation of INS (*Institut National des Statistiques* / National Statistical Institute)

<sup>4</sup> The estimation of the Study Team

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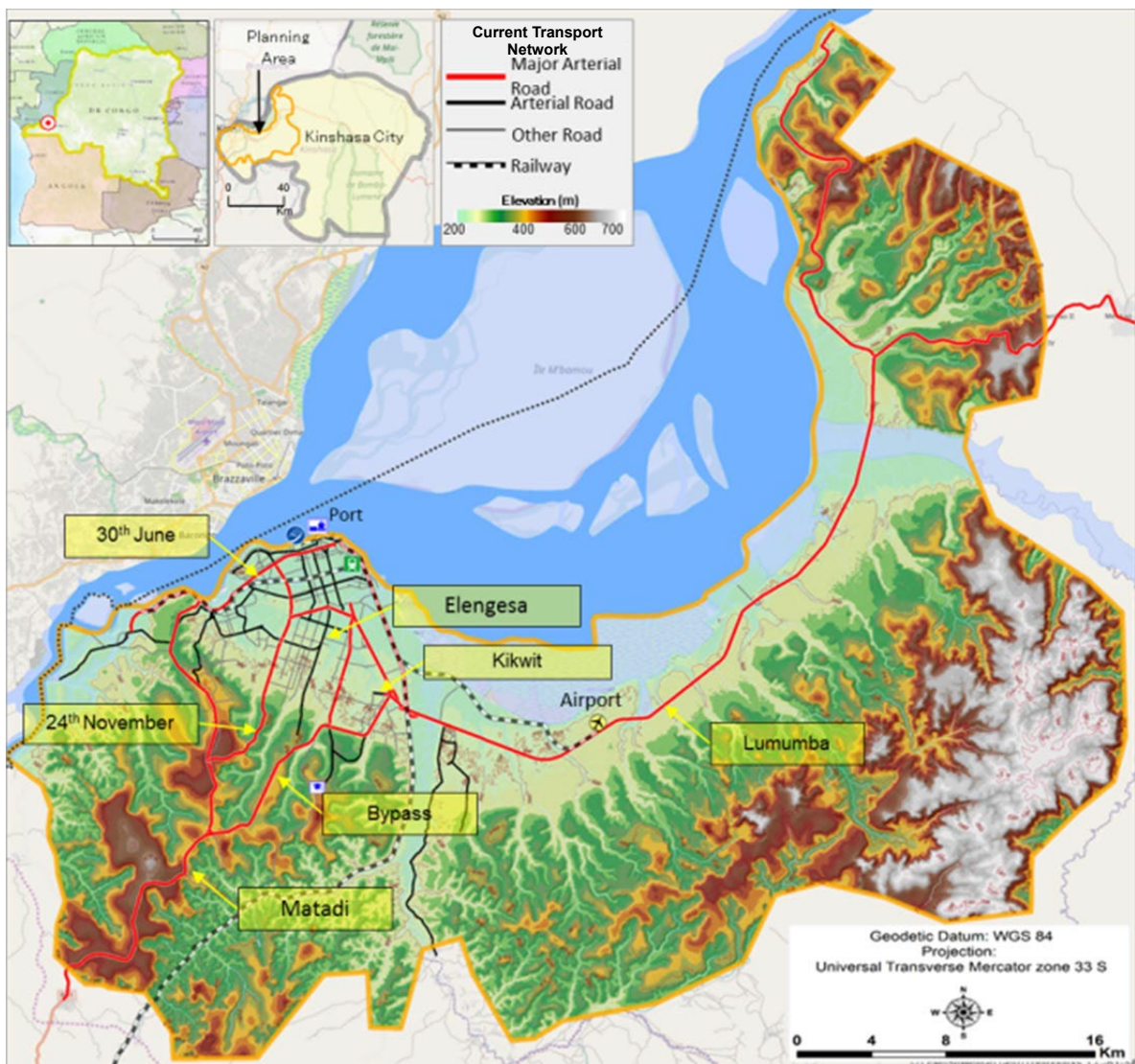


Master Plan in parallel with urban development.

### 1.1.2 Objectives of the Study

The Study aims to contribute to solving the urban transport problems in Kinshasa City by formulating the Urban Transport Master Plan with a middle-term transport infrastructure development programme toward 2030 as the target year, based on a transport demand forecast under a long-term development vision toward 2040. The Study also undertakes a preliminary feasibility study (Pre-F/S) on University Avenue.

The Study Area is the urbanised area of Kinshasa City, which covers about 1,450 km<sup>2</sup> out of the total city area of 10,667 km<sup>2</sup>, as defined in Figure 1.1.1.

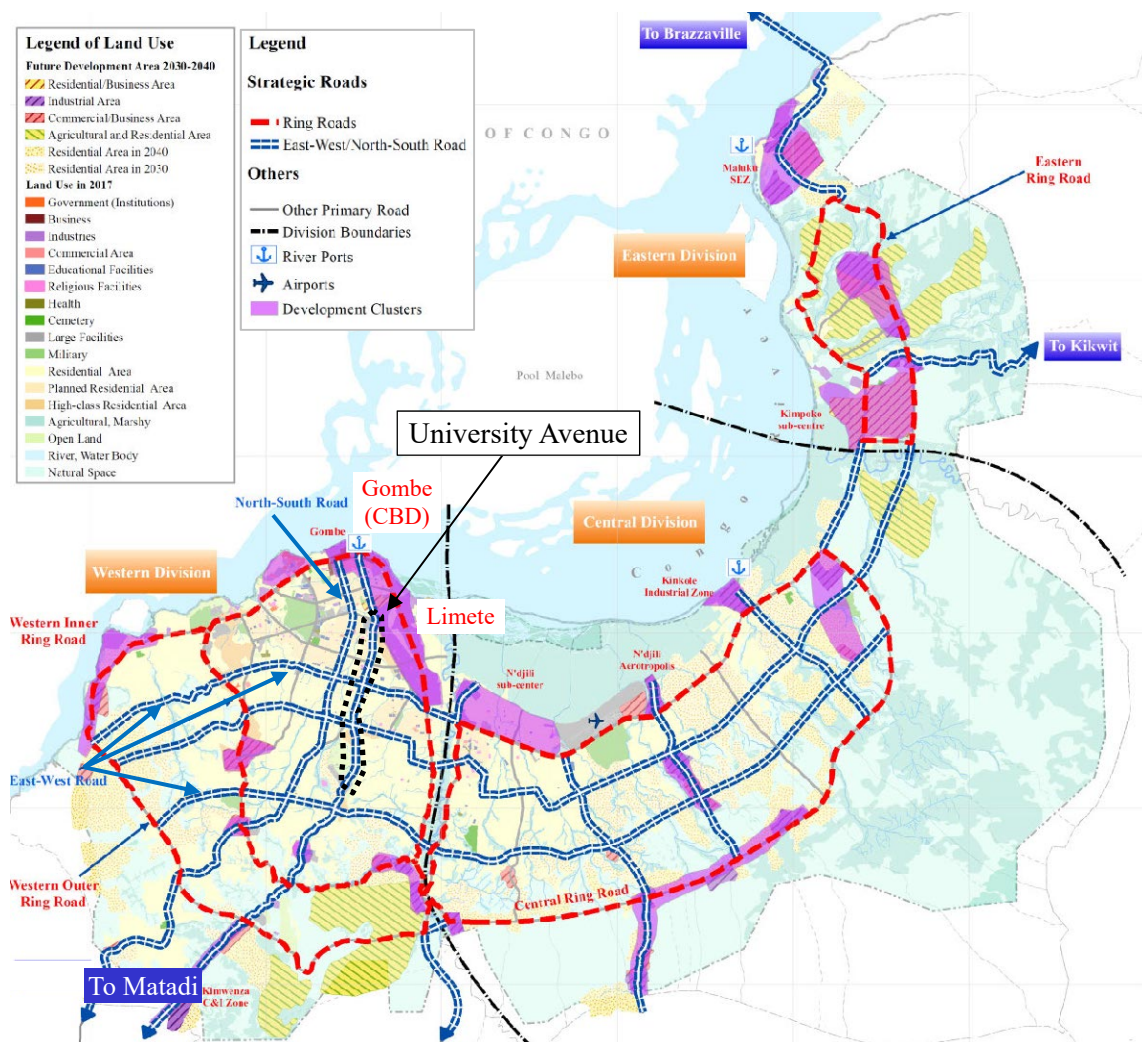


Source: The Study Team

Figure 1.1.1 Study Area

### 1.1.3 Background, Objectives and Location of the Pre-feasibility Study

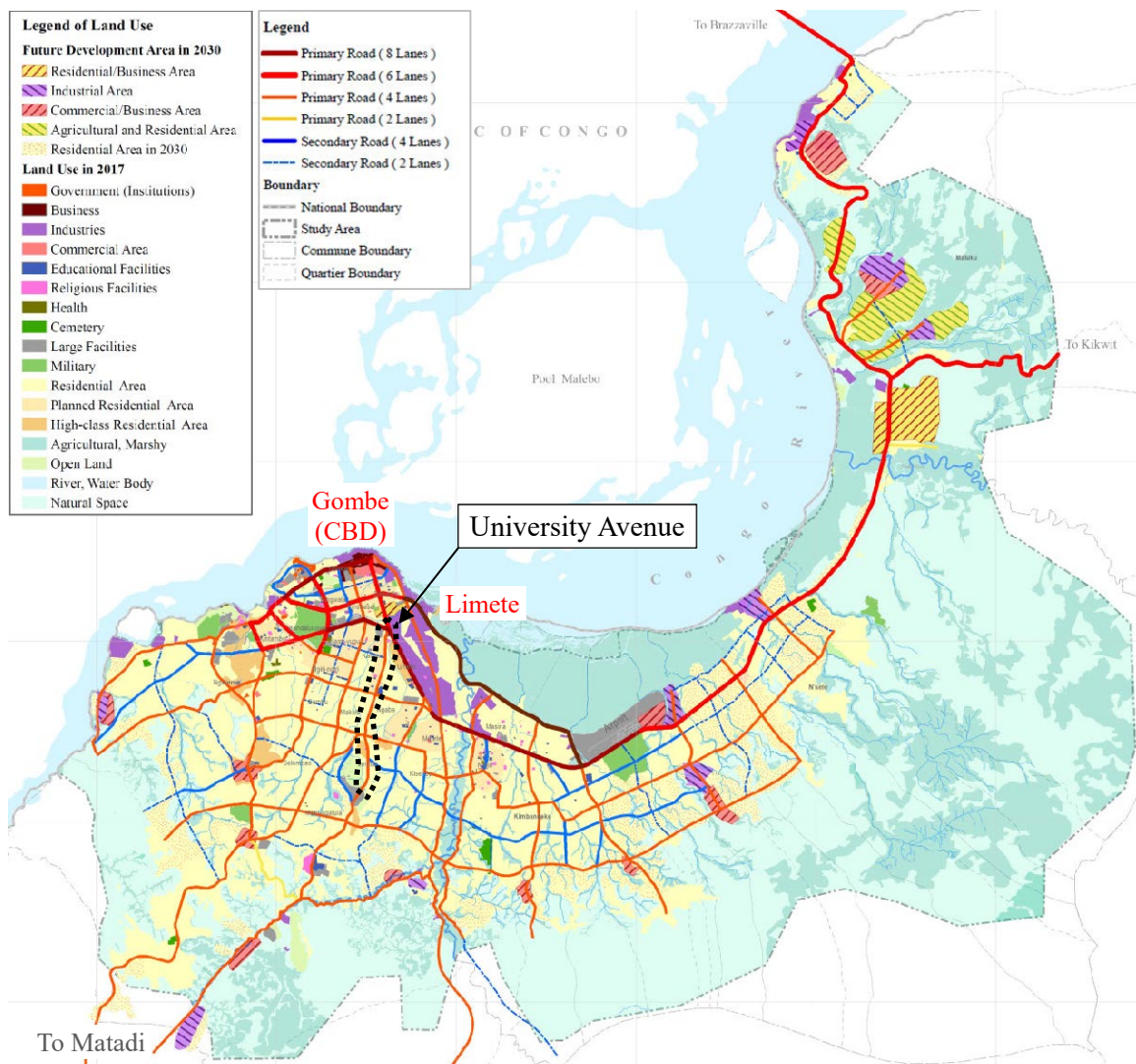
The Urban Transport Master Plan for the Study Area has been formulated as described in Volume 1 of the Study Report. The Master Plan has four objectives of urban transport development in the Study Area, namely ‘supporting urban economic activities’, ‘assuring equity in transport’, ‘improving safety and security’ and ‘achieving environmentally sustainable transport’. To achieve the objectives, nine policies on the urban transport development are proposed. ‘Network development of trunk roads and transits’ is one of these key policies. A hierarchical road network system including primary, secondary, tertiary and local roads is proposed. Among primary roads, the strategic roads are defined as roads serving heavy and long distance transport. Since University Avenue connects the CBD, industrial zones in Limete and the southern area of the Study Area as well as international ports of Matadi, Boma and Banana, it is categorized as the north-south direction strategic road to form a backbone of the road network as shown in Figure 1.1.2. It should be noted that University Avenue will serve not only for residents along the avenue, but also for national-level passengers and cargo transport.



Source: The Study Team

**Figure 1.1.2 Proposed Strategic Road Network in the Study Area**

Considering the important functions of University Avenue as a strategic road, the improvement of the 4-lane road is proposed by the year 2030 as shown Figure 1.1.3, the road network map in 2030. It also should be noted that University Avenue is planned to serve a bus rapid transit (BRT) route in 2030. As it is only a 4-lane road, the open system BRT, which does not have an exclusive lane for BRT, is proposed for the year 2030. Therefore, the project of “Development of University Avenue” was given priority to realize “Enhancement of Mobility Function of Road Network” (project ID: RD-ST-PR2) among the 5 short-term projects in the road sector.



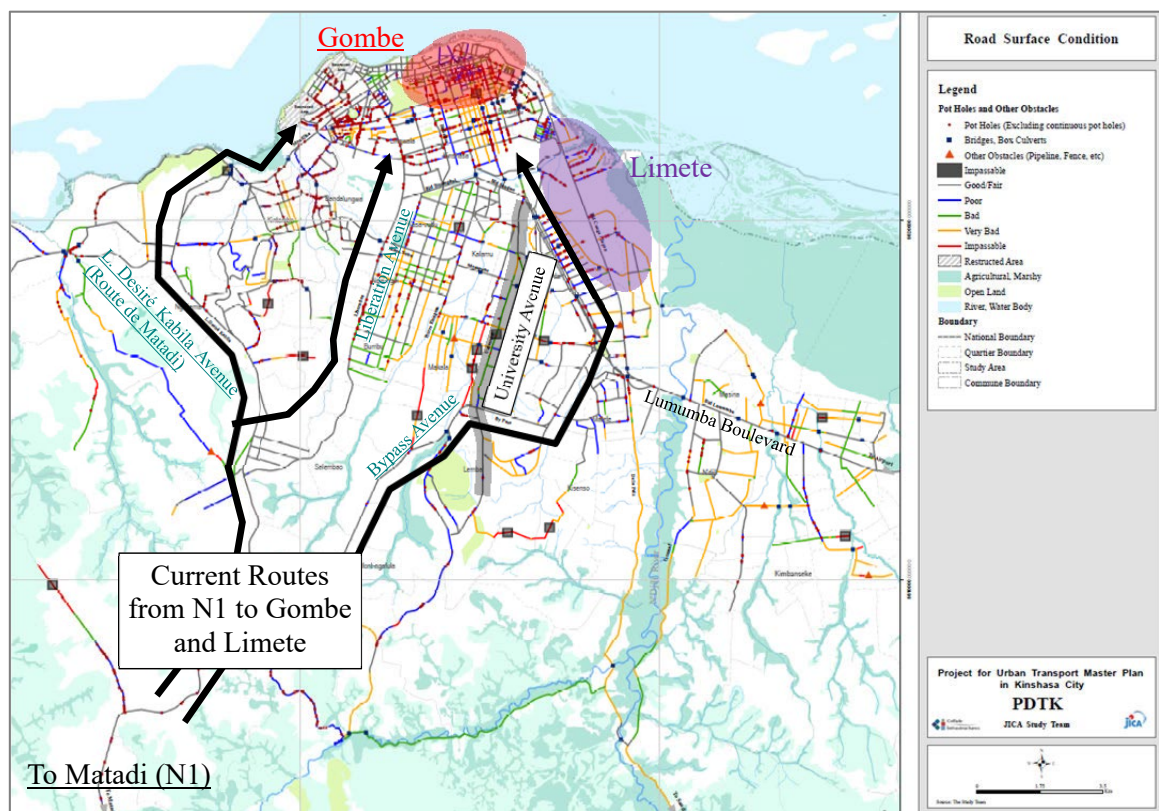
Source: The Study Team

**Figure 1.1.3 Proposed Road Network in 2030 for the Study Area**

To date, there exist only three north-south direction routes connecting CBD and the national road toward Matadi (the N1 Road). They are Liberation Avenue, Lumumba Boulevard linked to Bypass Avenue and L. Desiré Kabila Avenue (Route de Matadi), and they lie in parallel at about 6km

away from each other. Despite a strategic role of University Avenue as the additional north-south connection in the urban transport master plan, it is not fully functioning at present due to collapsed pavement, large scale pit holes and inundation of sewage water.

Since University Avenue is heavily damaged and impassable, vehicles from the south eastern direction such as trucks from Matadi Port have to detour to either the route via Liberation Avenue or the other route via Bypass Avenue and Lumumba Boulevard. Significant reduction of travel time can be expected by improving University Avenue and eventually connecting smoothly to Bypass Avenue for vehicle transport. It also contributes to alleviate the traffic congestion of Bypass Avenue and Lumumba Boulevard.



Source: The Study Team

**Figure 1.1.4 Current Routes from Matadi to CBD of Kinshasa**

Several large public facilities are located along University Avenue such as a stadium, universities and transport terminals as listed below and thus the bus route 19A had been operated by Transco. However, it has been suspended because of the impassable road conditions of University Avenue. Improvement of the avenue, bus routes and the introduction of future BRT routes can serve for the following facilities as well.

- a. Stadium Tata Raphael
- b. Universite Cathorique au Congo (University)

- c. Yolo Ezo (Terminal)
- d. Institut Supérieur d'Enseignement Technique Medical
- e. Rond Point Ngaba (Terminal)
- f. University of Kinshasa (University)

It also should be noted that areas along University Avenue accommodate a large number of population. Approximately, 802,000 people reside and 117,000 people work<sup>5</sup> in the 1km width along the section between Sendwe Intersection (Sendwe IS) and Rond-Point Ngaba (RP Ngaba/ Ngaba Roundabout) of University Avenue.

In addition, in consideration of early project implementation, some sections of University Avenue have significant width of open space. Thus, the time required for the relocation of buildings in those sections can be minimized and residents along University Avenue as well as residents of all the Study Area will be able to receive benefits from the project earlier.

## **1.2 Scope of the Study**

The Study is divided into three phases, they are, Phase 1: Analysis of Current Conditions, Phase 2: Formulation of Urban Transport Master Plan, and Phase 3: Preliminary Feasibility Study on University Avenue.

Study tasks included in the respective Study Phases are listed below, and their flow is shown in Figure 1.2.1.

Phase 1: Data Collection and Analysis of Current Conditions (Volume 1)

- (1) Data Collection and Analysis
- (2) IC/R Preparation and Discussion
- (3) Examination of Existing Plans, Policies, Regulations and Capacity of Relevant Agencies on Urban Transport
- (4) Technical Transfer Planning
- (5) Development Trends of Land Uses and Spatial Corridors
- (6) Creation of Base Map Data
- (7) Transport Survey and Analysis

Phase 2: Formulation of Urban Transport Master Plan (Volume 1)

- (8) Future Transport Demand Forecast
- (9) Socio-Economic Framework
- (10) Modelling and Future Transport Demand Forecast
- (11) Consideration of Alternative Development Scenarios toward 2040
- (12) Optimum Urban Transport Plan Based on Development Scenario
  - a. Public Transport Plan
  - b. Road Development Plan
  - c. Traffic Management Planning

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<sup>5</sup> Estimates by the Study Team based on the Commuter Survey in 2017

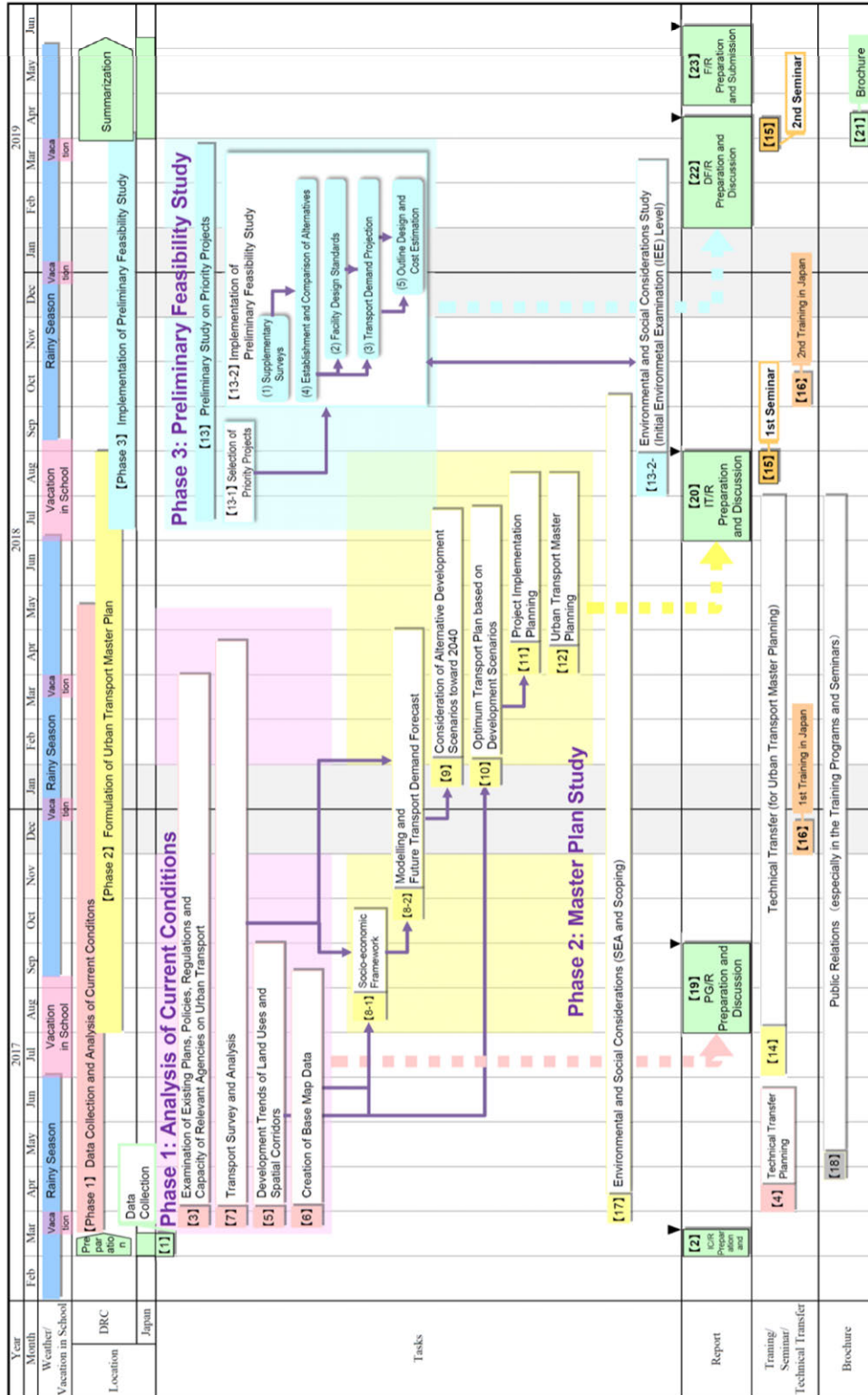
- (13) Project Implementation Planning
  - a. Identification of Individual Projects
  - b. Project Programmes
  - c. Implementation System
- (14) Urban Transport Master Planning

Phase 3: Preliminary Feasibility Study on University Avenue (Volumes 2 and 3)

- (15) Preliminary Study on Priority Projects
  - a. Selection of Priority Projects
  - b. Implementation of Preliminary Feasibility Study
- (16) Technical Transfer
- (17) Seminars
- (18) Training in Japan
- (19) Environmental and Social Considerations (SEA and Scoping)

This Pre-feasibility Study has been carried under the assumption that the improvement of University Avenue will be implemented with Japanese grant aid.

Nothing in this Study Report should be understood as implying a commitment of JICA or the Government of Japan to a provision of a grant aid.



Source: The Study Team

Figure 1.2.1 Flow Chart of Study Tasks

## **1.3 Operation of the Study**

### **1.3.1 Institutional Arrangement for Preparing Urban Transport Master Plan**

The institutional arrangement for the Study execution is shown in Table 1.3.1, and the Study Team has been coordinating with these relevant authorities. MITPR (Ministry of Infrastructure, Public Works and Reconstruction) and JICA (Japan International Cooperation Agency) agreed that the CI (Infrastructure Unit) is primarily in charge of Study execution, and coordinates with relevant authorities through JCC (Joint Coordinating Committee) meetings and capacity development efforts.

TWG (Technical Working Group) is established under the JCC for technical discussion. Capacity development is implemented for members of the technical working group, in order to enable them to update the Urban Transport Master Plan in the future.

In addition to the authorities listed in Table 1.3.1, the CI is to invite relevant authorities and organizations as the need arises.



**Table 1.3.1 Members and Functions of JCC and TWG (Same as R/D)**

	<b>Joint Coordinating Committee (JCC)</b>	<b>Technical Working Group (TWG)</b>
Functions	<ul style="list-style-type: none"> <li>• To approve work plan, review overall progress</li> <li>• To conduct monitoring and evaluation of the Project</li> <li>• To coordinate among the relevant organisations</li> <li>• To exchange opinions on major issues arising during implementation of the Project</li> </ul>	<ul style="list-style-type: none"> <li>• To work with JICA mission on daily basis and facilitate necessary arrangements for smooth implementation of the Project</li> <li>• To examine and analyse the technical aspects of the Reports</li> <li>• To coordinate and harmonise the stakeholders of the Project and ensure involvement of the concerned authorities</li> <li>• To prepare materials (reports/presentations) for JCC</li> <li>• To correspond to the requests/inquiries made by JCC on technical matters.</li> </ul>
Members	<p>Chair (Project Director): Coordonnateur de la Cellule Infrastructures, Ministère des Infrastructures et Travaux Publics</p> <p><u>Member</u></p> <ol style="list-style-type: none"> <li>1) Conseiller Principal Infrastructures de la Présidence</li> <li>2) Conseiller Principal au Collège chargé des Infrastructures de la Primature</li> <li>3) Conseiller Planification, MITPR</li> <li>4) One representative of Ministère Provincial du Plan, Budget, Travaux Publics et Infrastructures</li> <li>5) One representative of Ministère Provincial des Transports, Sports, Jeunesse et Loisirs</li> <li>6) One representative of Bureau d'Etudes d'Aménagement et d'Urbanisme</li> <li>7) One representative of Office des Voiries et Drainage</li> <li>8) One representative of Commission Nationale de Prévention Routière</li> <li>9) One representative of Groupe d'Etudes des Transports</li> <li>10) One representative of Office des Routes</li> <li>11) One representative of Société Commerciale des Transports et des Ports</li> </ol>	<p>Project Manager:                      Le Chef de section voiries de la Cellule Infrastructures, Ministère des Infrastructures et Travaux Publics</p> <p><u>Members</u></p> <p><u>One expert from the below agencies:</u></p> <ol style="list-style-type: none"> <li>1) Ministère des Infrastructures et Travaux Publics</li> <li>2) Ministère Provincial du Plan, Budget, Travaux Publics et Infrastructures</li> <li>3) Ministère Provincial des Transports, Sports, Jeunesse et Loisirs</li> <li>4) Cellule Infrastructures</li> <li>5) Bureau d'Etudes d'Aménagement et d'Urbanisme</li> <li>6) Office des Voiries et Drainage</li> <li>7) Commission Nationale de Prévention Routière</li> <li>8) Groupe d'Etudes des Transports</li> <li>9) Office des Routes</li> <li>10) Société Commerciale des Transports et des Ports</li> <li>11) Agence Congolaise de l'Environnement</li> </ol>
	Ministère des Infrastructures et Travaux Public may select necessary representatives of relevant ministries and organisations other than indicated above.	

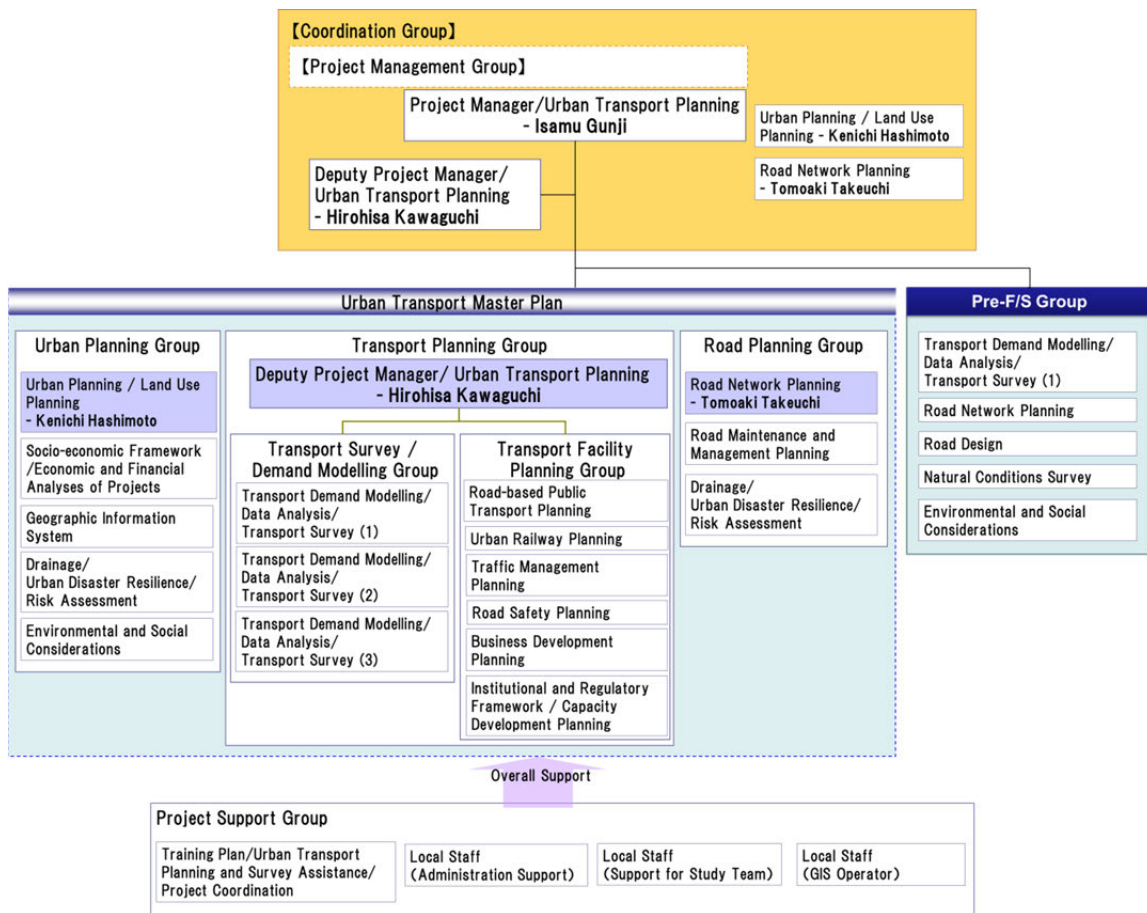
Source: The Study Team

MTVC (*Ministère de Transport et Vies de Communications / Ministry of Transport and Communications*) is overseeing GET (*Groupe d'Etudes des Transports / Transport Study Group*), CNPR (*Commission Nationale de Prévention Routière / National Road Safety Commission*) and SCTP (*Société Commerciale des Transports et des Ports / Commercial Society of Transport and Ports*). The MTVC is also in charge of TRANSCO (*Transport au Congo / Congo Transport*), which operates buses in Kinshasa City. The Study Team, therefore, requested and received cooperation from the MTVC for collecting data/information on bus, railway, port and road traffic safety policies.

The abovementioned institutions are expected to implement individual projects identified by the Urban Transport Master Plan.

### 1.3.2 Study Team Members

The organisation of the Study Team is presented in Figure 1.3.1.



Source: The Study Team

**Figure 1.3.1 Structure of the Study Team**

## 1.4 Contents of the Report

The Study Report consists of three volumes. Volume 1 is on the Urban Transport Master Plan for the Study Area corresponding to Phase 1 (Data Collection and Analysis of Current Conditions) and Phase 2 (Formulation of Urban Transport Master Plan) of the Study. Volume 2 and 3 are corresponding to Phase 3, Preliminary Feasibility Study on University Avenue. Volume 2 covers the section from Sendwe IS (Sendwe Intersection) to RP Ngaba (*Rond-Point Ngaba / Ngaba*

Roundabout), namely Section A, and, Volume 3 covers the section from RP Ngaba to University of Kinshasa, namely Section B, considering current road network functions as well as availability of open spaces.

Volume 2 of the Final Report consists of 8 Chapters, focusing on a Preliminary Feasibility Study on the development of Section A (Sendwe IS – RP Ngaba) of University Avenue. Major study outcomes are summarised per chapters as follows:

**Chapter 1: Introduction** mainly describes the objectives, scope and operation of the Study and introductory statements of the following chapters.

**Chapter 2: Transport Survey and Transport Demand Projection** deals with a transport survey undertaken for the University Avenue, and introduces analytical results of the survey. Based on this survey, a transport model was built in order to make a demand projection of estimated traffic volume by section defined on the University Avenue.

**Chapter 3: Setting and Comparison of Alternatives** describes a setting of alternatives with typical cross sections which are mainly composed of carriage-way, shoulder and pedestrian path. Furthermore, a comprehensive comparison of the alternatives is discussed.

**Chapter 4: Approach on Facility Design and Basic Design** discusses the road alignment and facility design of road pavement and drainage on University Avenue. In addition, a basic design of infrastructure on the University Avenue is illustrated.

**Chapter 5: Outline Project Cost** discusses the procurement situation and precondition of cost estimation, which include the information on labour related laws and regulations, local subcontractors, technical capability, human resources and construction machinery ownerships, a procurement of materials and construction machineries and related taxes, which should be considered to implement the development of Section A. Based on this information, the outline project cost on Section A is estimated by an alternative plan with consideration of its operation and maintenance cost.

**Chapter 6: Financial Burden on DR Congo Side** starts with the description of the actual condition of underground utilities such as water pipes and ground utilities such as electrical cables on University Avenue. Furthermore, the estimated cost on land acquisition and compensation to the resettlement of project affected people are discussed. Based on these conditions, the estimation of cost burden on DRC side for the project implementation is summarized.

**Chapter 7: Environmental and Social Considerations** analyse environmental and social impacts brought about by the project implementation of University Avenue. In addition, survey items on EIA (Environmental Impact Assessment) are discussed.

**Chapter 8: Toward Implementation** discusses the expected impacts of the project with the assumed implementation schedule of the project. Further points to be considered on land acquisition, resettlement and an implementation system are summarized toward the implementation.

## CHAPTER 2 Transport Survey and Transport Demand Projection

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### 2.1 Transport Survey

#### 2.1.1 Transport Survey

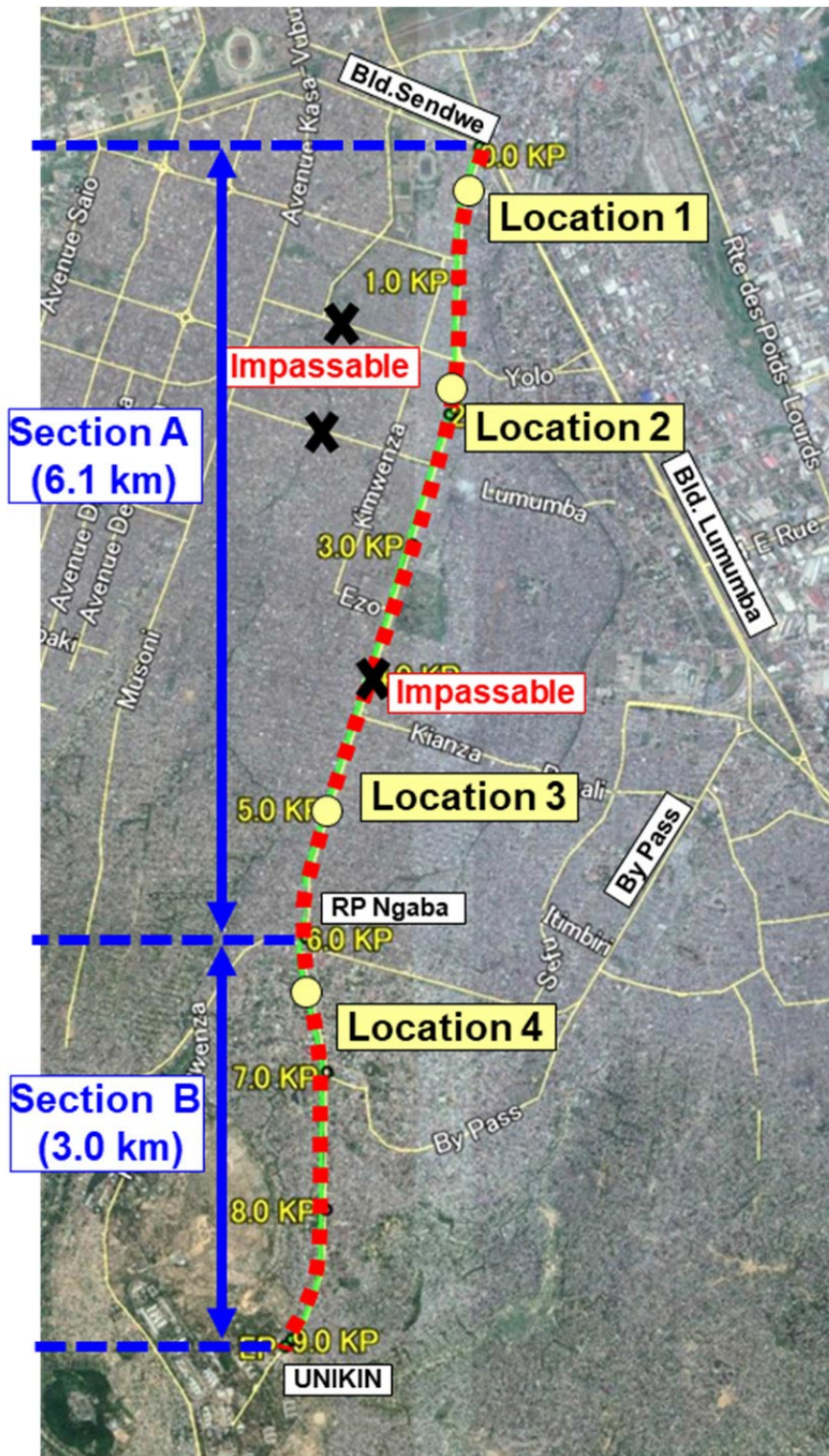
During the interval between the transport survey conducted for the Master Plan preparation in 2017 and the current situation in November 2018, the traffic situation on Section A (Sendwe IS - RP Ngaba) of University Avenue changed drastically due to the influence of the rehabilitation work of University Avenue and the closure of University Avenue near Yolo-Ezo IS (Intersection) after heavy rain in October 2017. Therefore, an additional transport survey focusing on the current traffic demand of University Avenue was conducted to supplement the transport surveys conducted in 2017 as part of the Master Plan study.

Table 2.1.1 shows contents of the additional transport survey on University Avenue. The survey was conducted at 4 locations from 6AM to 9PM using digital video recorder on October 2018. Survey locations are shown in Figure 2.1.1.

**Table 2.1.1 Contents of Additional Transport Survey**

Item	Contents
Method	<ul style="list-style-type: none"> <li>• Manual Count Survey using digital video recorder. The surveyors counted number of vehicles by direction by 15minutes interval</li> </ul>
Classification	<ul style="list-style-type: none"> <li>• Three (3) Non-motorized Transport (NMT)                             <ol style="list-style-type: none"> <li>1) Pedestrian,</li> <li>2) Cycle, and</li> <li>3) Others</li> </ol> </li> <li>• Thirteen (13) Motorized Transport                             <ol style="list-style-type: none"> <li>4) Motorcycle (MC),</li> <li>5) Three Wheeler,</li> <li>6) Car (private use),</li> <li>7) Car (Taxi),</li> <li>8) Passenger Van,</li> <li>9) Passenger Van (Taxi bus),</li> <li>10) Pickup,</li> <li>11) Light Goods Truck (LGT),</li> <li>12) Heavy Goods Truck (HGT),</li> <li>13) Articulated Container Truck (ACT),</li> <li>14) Minibus (Mbus),</li> <li>15) Large bus (Lbus), and</li> <li>16) Others</li> </ol>                             In addition, Minibus and Large bus were classified by operators (Transco, Newtranskin, Esprit de Vie, and other)                         </li> </ul>
Survey Date	<ul style="list-style-type: none"> <li>• 1 weekday (Tuesday, Wednesday or Thursday) by location                             <ul style="list-style-type: none"> <li>Location 1: October 30, 2018 (Tuesday)</li> <li>Location 2: October 24, 2018 (Wednesday)</li> <li>Location 3: October 23, 2018 (Tuesday)</li> <li>Location 4: October 31, 2018 (Wednesday)</li> </ul> </li> </ul>

Source: The Study Team



Source: Google, Digital Globe taken on the 6th March, 2018, edited by the Study Team

Figure 2.1.1 Survey Location

## 2.1.2 Result of Transport Survey

### (1) Daily Traffic Volume

Daily traffic volumes and vehicle composition on University Avenue are shown in Figure 2.1.2 and Table 2.1.3, respectively. The PCU (Passenger Car Unit) factors are the same as those were used for the Master Plan and expansion factors for converting traffic volume from 15 hour duration to 24 hour duration was calculated based on the result of screen line survey on Lumumba Boulevard in June 2017. Table 2.1.2 shows applied PCU factors and expansion factors.

**Table 2.1.2 PCU and Expansion Factors by Transport Mode**

Transport Mode		PCU Factor *1	Expansion Factor
Motorcycle	Motorcycle, Three Wheeler	0.3	1.103
Car	Car (Private use)	1.0	1.117
	Pickup	1.0	1.089
Taxi	Car (Taxi)	1.0	1.117
Bus	Passenger Van	1.5	1.065
	Minibus	2.0	1.063
	Large Bus	2.0	1.030
Truck	Light Goods Truck	1.5	1.102
	Heavy Goods Truck	2.5	1.031
	Articulated Set	2.5	1.123

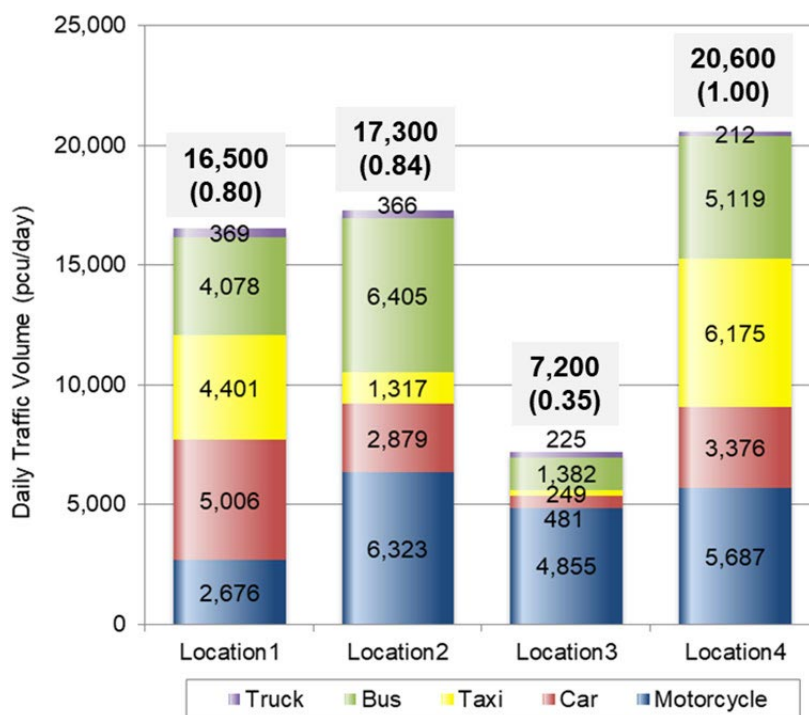
Note: The PCU factor was discussed at the 15th Workshop held on February 2018

Source: The Study Team

Since the section of University Avenue near Yolo-Ezo IS was closed due to heavy rain in October 2017, the through-traffic on Section A of University Avenue has to detour inevitably to Lumumba Boulevard or Liberation Boulevard. Thus, the current major traffic on Section A is composed of those coming to/from surrounding area of University Avenue and limited through-traffic which has to return at the closed point of University Avenue and to choose detour routes.

As shown in Figure 2.1.2 and Table 2.1.3, current daily traffic volumes of locations 1, 2 and 3 are 16,500 pcu/day, 17,300 pcu/day, and 7,200 pcu/day, respectively. Despite little through-traffic on Section A, traffic volume at locations 1 and 2 almost reach the capacity of the 2-lane road (20,500 pcu/day, refer to Section 2.2 of Volume 1 of the Study Report). It is therefore assumed that the traffic volume in Section A could have exceeded the capacity of the 2-lane road, if Section A of University Avenue were fully operational in 2018.

On the other hand, daily traffic volume of location 4 already exceeds the capacity of the 2-lane road (20,600 pcu/day) and it will further increase due to population growth and land development in the future.



Note: The daily traffic volume was estimated based on traffic volume ratio of 15 hour and 24 hour durations observed at a point on Lumumba Boulevard in 2017.

The figure in the parentheses indicates the congestion rate derived from daily traffic volume and road capacity. The road capacity of the two-lane road is set as 20,500 pcu/day based on Highway Capacity Manual 2010

Source: The Study Team

**Figure 2.1.2 Daily Traffic Volume and Congestion Rate**

**Table 2.1.3 Daily Traffic Volume and Vehicle Composition**

		Motor cycle	Car	Taxi	Bus	Truck	Total
Number of Vehicles (pcu/day)	Location1	2,676	5,006	4,401	4,078	369	16,529
	Location2	6,323	2,879	1,317	6,405	366	17,289
	Location3	4,855	481	249	1,382	225	7,192
	Location4	5,687	3,376	6,175	5,119	212	20,569
Vehicles Composition (%)	Location1	16.2%	30.3%	26.6%	24.7%	2.2%	100.0%
	Location2	36.6%	16.7%	7.6%	37.0%	2.1%	100.0%
	Location3	67.5%	6.7%	3.5%	19.2%	3.1%	100.0%
	Location4	27.7%	16.4%	30.0%	24.9%	1.0%	100.0%

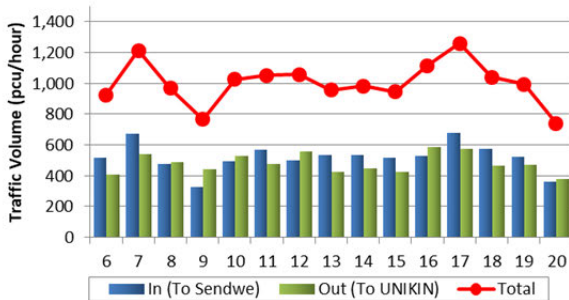
Source: The Study Team

**(2) Hourly Fluctuation of Traffic Volume**

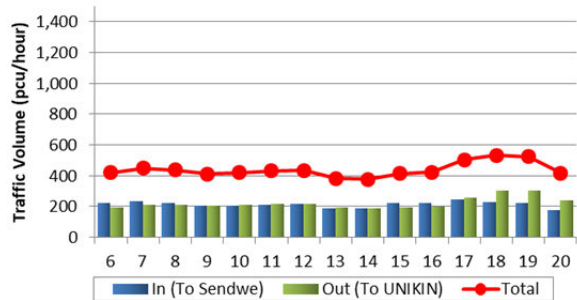
Figure 2.1.3 shows hourly fluctuation of traffic volume by direction by location. Figure 2.1.4 and Figure 2.1.5 shows traffic situation of morning and evening peak hour.

Those diagrams show that there are two peak hours during the day. The first peak is 7-8 AM, and the second peak is 5-6 PM or 6-7 PM depending on the survey location. They also show that the current maximum hourly traffic volume is approximately 1,400 pcu/hour/both directions.

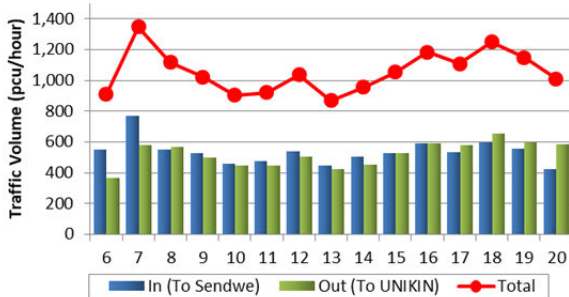
**Location 1**



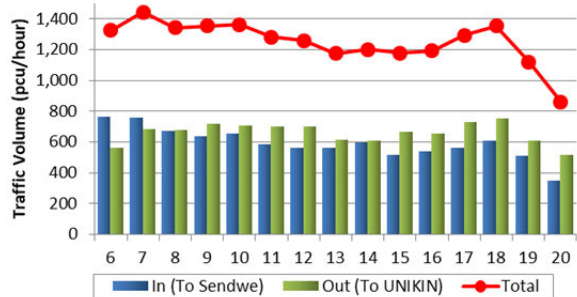
**Location 3**



**Location 2**



**Location 4**



Source: The Study Team

**Figure 2.1.3 Fluctuation of Hourly Traffic Volume**



❑ Location 1



❑ Location 3



❑ Location 2



❑ Location 4



Source: The Study Team

**Figure 2.1.4 Traffic Situation of Morning Peak Hour (7-8 AM)**

❑ Location 1



❑ Location 3



❑ Location 2



❑ Location 4



Source: The Study Team

**Figure 2.1.5 Traffic Situation of Evening Peak Hour (5-6 PM)**

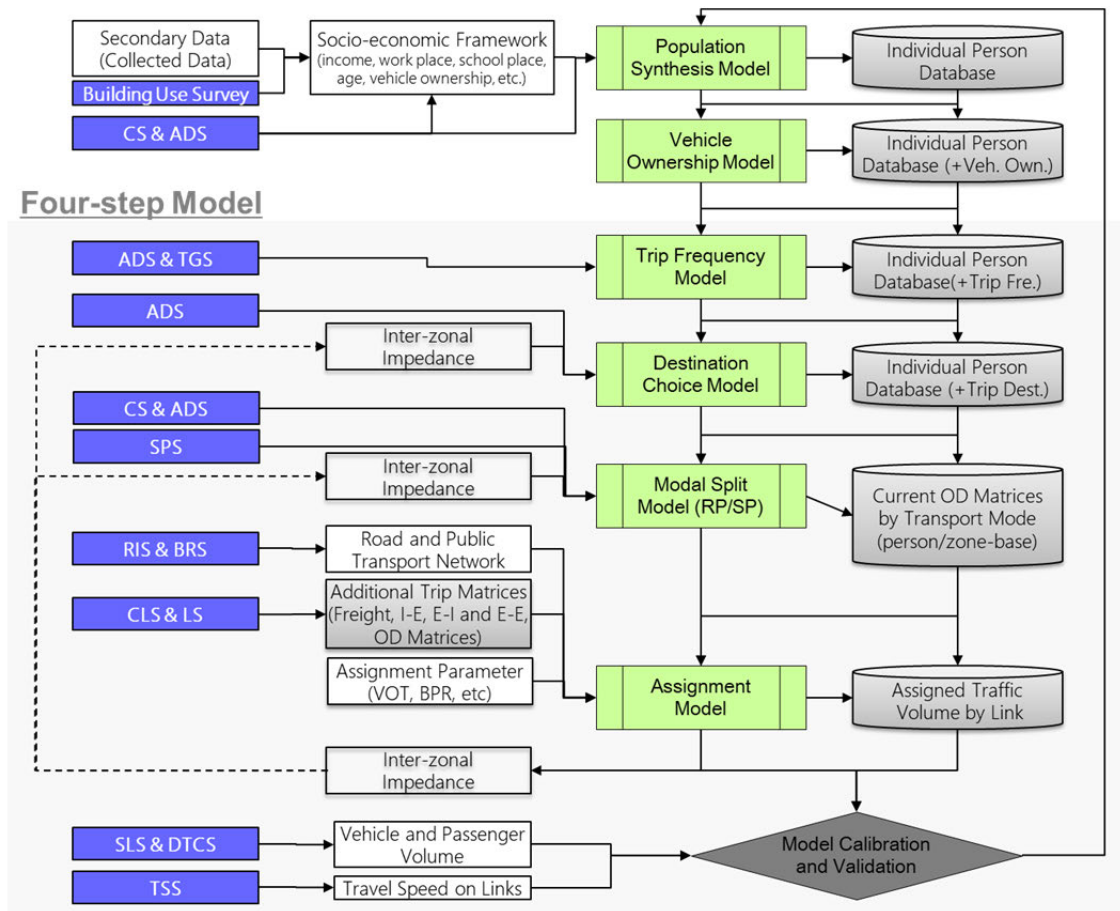
## 2.2 Transport Demand Projection

### 2.2.1 Modelling Approach

#### (1) Outline of Transport Demand Model

Traffic demand projection for University Avenue between Sendwe IS and University of Kinshasa was estimated as derivative of the work done in earlier transport demand projection of the Master Plan. Thus, the analysis for this demand projection relies on the transport model built for the Master Plan (hereinafter simply referred to as the transport model) and additionally, data and assumptions made for the traffic demand projection of University Avenue.

Figure 2.2.1 shows the flow of building transport models. The Master Plan developed a conventional four-step model with disaggregates approach based on a series of transport survey results and secondary data. The base year calibration was done for the year 2017 on two screen lines.



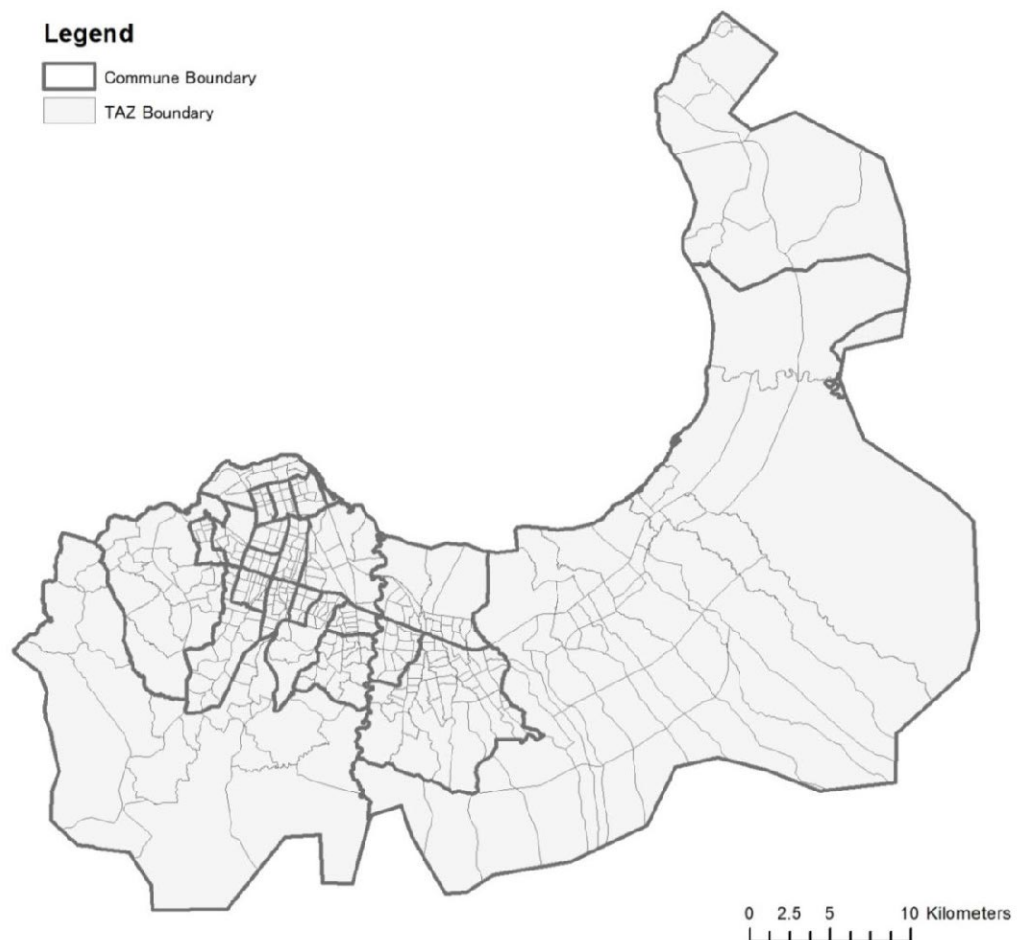
Source: The Study Team

**Figure 2.2.1 Flow of Transport Model**

The further details about survey result and modelling method are mentioned in Volume 1 of the Study Report.

## (2) Zoning System

In the Study, the target area and zoning system for transport demand projection are set as the same area of the Master Plan as shown in Figure 2.2.2 and Table 2.2.1. This zoning system consists of 395 internal traffic analysis zones (TAZs) and 6 external and special generator TAZs (Traffic Analysis Zones). The basis of internal TAZs are derived from quartier boundaries in 2017. In addition, it should be noted that several internal TAZs are divided into 2 or 3 TAZs taking into account the comparatively large size of the quartier area, future development plans, and available socio-economic data. The 6 external and special generator TAZs incorporate 3 national and provincial roads, a port, the N'djili Airport and the Kinshasa-Brazzaville Bridge to capture significant future movements across the boundaries of the Study Area.



Note: The quartier boundaries are defined through technical collaboration with the provincial Ministry of Interior

Source: The Study Team

**Figure 2.2.2 Zoning System (Whole Area)**

**Table 2.2.1 Summary of Zone System**

Area Description		Number of TAZs
Internal TAZs	24 communes (365 quartiers)	395
External and Special Generator TAZs	National and provincial roads	3
	Port	1
	N'djili Airport	1
	Kinshasa-Brazzaville Bridge (future development)	1
Total		401

Source: The Study Team

### (3) Socio-Economic Framework

Transport demand is responsive to the socio-economic framework which indicates economic activities and demographic changes within the target area. The socio-economic framework for the Master Plan has been estimated for the several indicators such as population, employment and the Gross Regional Domestic Products (GRDP) until the time horizon of 2030 and 2040 commencing with the year 2017. Table 2.2.2 shows socio-economic framework assumed for the preparation of the Master Plan.

**Table 2.2.2 Socio-Economic Framework of the Master Plan**

	2017	2030	2040	CAGR (2017-2030)	CAGR (2030-2040)
Population in Kinshasa City (thousand)	12,505	20,000	26,000	3.7%	2.7%
GRDP per capita (constant 2017 USD)	597	964	1,395	3.8%	3.8%
GRDP (constant 2017 million USD)	7,463	19,285	36,263	7.6%	6.5%
Population Ages 15-64 (thousand)	5,943	9,781	13,000	3.9%	2.9%
Ratio Ages 15-64 of Total Population (%)	48%	49%	50%		
Employment (thousand)	2,897	4,892	6,630	4.1%	3.1%
Employment Ratio of Population Ages 15-64 (%)	49%	50%	51%		
Labour Productivity (USD/person)	2,576	3,942	5,470	3.3%	3.3%

1 \*Black colour: actual figure from the statistics, blue colour with yellow highlight: inputs by the Study Team, blue colour: outputs by the Study Team, CAGR: Compound Annual Growth Rate

Source: The Study Team

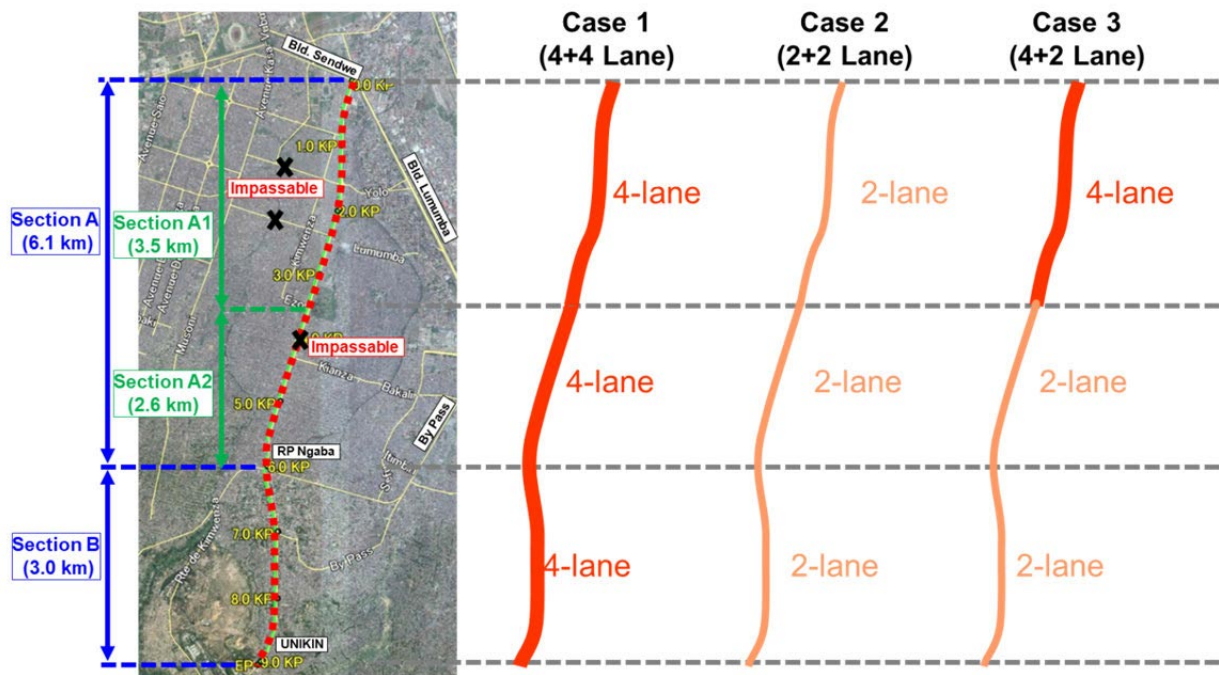
### 2.2.2 Assumptions for Route Assignment Model

The route assignment model is used to determine the route chosen between each origin and destination of the trip, and it includes two assignment processes: highway assignment for private modes and transit assignment for public transport modes.

#### (1) Assignment Case

Three cases for the traffic demand projection are set for the comparison as shown in Figure 2.2.3. Future road and public transport projects other than University Avenue are assumed to remain unchanged among the assignment cases.

- Case 1 (4+4+4): 4-lane development (Section A1, A2 and B)
- Case 2 (2+2+2): 2-lane development (Section A1, A2 and B)
- Case 3 (4+2+2): 4-lane (Section A1) and 2-lane (Section A2 & B) development



Source: Google, Digital Globe taken on the 6th March, 2018, edited by the Study Team

Figure 2.2.3 Number of Lanes by Assignment Case

Table 2.2.3 Condition of University Avenue

	2 lanes	4 lanes
Capacity (pcu/day)	20,500	39,100
Speed Limit	60 km/h	60 km/h

Source: The Study Team estimates based on Highway Capacity Manual 2010, USA

**(2) Target Year for Demand Projection**

Future transport demand projection on University Avenue was conducted for the following two target years.

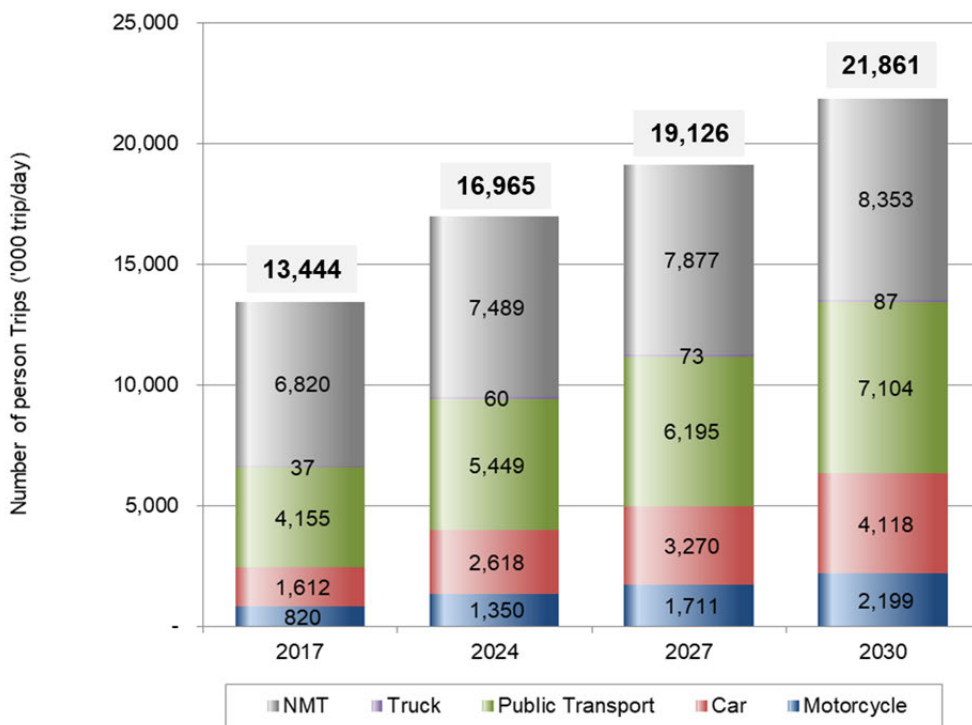
Year 2024: Opening year,

Year 2027: Three Years after opening to traffic

**(3) Future OD Matrices**

Future OD matrices for the year 2024 and 2027 were estimated from 2017 OD matrices and 2030 OD matrices of public intensive scenario, which were prepared by the Study. The matrices of motorcycle, car, public transport, truck, and NMT were estimated by interpolation method using average annual growth rate (AAGR).

Total number of daily person trips in 2017, 2024, 2027 and 2030 were estimated at approximately 13,444 thousand, 16,965 thousand, 19,126 thousand, and 21,861 thousand, respectively as shown in Figure 2.2.4.



Source: The Study Team

**Figure 2.2.4 Number of Daily Person Trips (Unit: ‘000 trips/day)**

#### (4) PCU Factor and Average Vehicle Occupancy

Transport modes applied to the transport demand projection are classified into eight categories, among which five modes belong to the private transport and remaining three modes to the public transport. PCU factors and average occupancies by transport mode are listed in Table 2.2.4.

**Table 2.2.4 Average Vehicle Occupancy and PCU Factor for Route Assignment Model**

Transport Mode		PCU Factor (*1)	Average Vehicle Occupancy
Private Transport	Motorcycle	0.3	1.70
	Car	1.0	2.82
	Light Goods Truck (LGT)	1.5	2.02
	Heavy Goods Truck (HGT)	2.5	2.05
	Articulated Set (ACT)	2.5	2.17
Public Transport	Passenger Van (Van)	1.5	(*2)
	Minibus	2.0	(*2)
	Large Bus	2.0	(*2)

\*1: PCU factor was discussed at the 15th Workshop held on February 2018

\*2: The average vehicle occupancy was not used for the transit assignment

Source: The Study Team

#### (5) Value of Time (VOT)

Table 2.2.5 shows Value of Times (VOTs) for the target years adopted in this study. VOTs in 2027 and 2030 were estimated using income approach method by the Master Plan, and VOTs in 2024 and 2027 were estimated using interpolation method by AAGR between the years 2017 and 2030.

**Table 2.2.5 Value of Time**

Trip Type		VOT (CDF/Hour)			
		2017	2024	2027	2030
Person Trip	Low Income	218	218	218	218
	Middle Income	660	731	761	791
	High Income	2,825	2,861	2,876	2,891
Freight Trip	LGT	1,315	1,421	1,466	1,511
	HGT	1,981	2,087	2,132	2,177
	ACT	2,980	3,086	3,131	3,176

Source: The Study Team

#### (6) BPR Function

Highway assignment process is daily and vehicle-based assignment which is based on the user equilibrium method. The travel time between origin and destination of the trip are converted to a generalized cost based on abovementioned VOTs. The speed flow curves are based on the following BPR formula, which was proposed by the US Bureau of Public Roads (BPR) in 1964 in a traffic assignment manual and it is being widely used around the world.

**BPR Function**      $t = t_0 \left( 1 + \alpha \left( \frac{V}{C} \right)^\beta \right)$

- Where,
- $t$  : Travel Time
  - $t_0$  : Free flow Time
  - $V$  : Traffic Volume
  - $C$  : Road Capacity
  - $\alpha$  : Parameter (= 0.15)
  - $\beta$  : Parameter (= 4.00)

Transit assignment process is daily and a person-based assignment using the generalized cost between origin and destination of the trip. The generalized cost includes fare, access/egress time, waiting time, walk time, transfer time and travel time in public transport.

**(7) Key Attribute to Road Network**

The road network for route assignment consists of the following key attributes.

- Distance
- Road Class
- Road Condition
- Capacity
- Velocity

The distance, road class, and road conditions were identified based on statistical data from OVD and results of road inventory survey. The capacity setting was defined by Highway Capacity Manual 2010. The peak hour factor (K value) and directional distribution (D value) were assumed at 8.0% and 0.6, respectively, based on the Screen Line Survey. Furthermore, side friction (pedestrian activities, hawkers, etc.) plus the condition of the existing roads were used to adjust the road capacity and traffic velocity. Consequently, the following capacity and velocity settings and adjustment factors by road condition were applied to the route assignment model as shown in Table 2.2.6 and Table 2.2.7, respectively.

**Table 2.2.6 Capacity and Velocity Setting**

Road Class	Direction	Lanes	Capacity (PCU/day)	Velocity (km/h)
National, Provincial, Primary and Secondary Roads	Both	2	20,500	60
	Both	4	39,100	60
	Both	6	56,000	60
	Both	8	74,700	60
	Both	10	93,400	60
	One	1	10,300	50
	One	2	19,600	60
	One	3	28,000	60
	One	4	37,400	60
	One	5	46,700	60
Collector Roads (unpaved)	Both	1	7,000	40

Source: The Study Team, estimated based on the Highway Capacity Manual and the Screen Line Survey



**Table 2.2.7 Adjustment Factor by Road Condition**

Road Condition	Capacity Adjustment Factor	Velocity (km/h)
Good	0.8	30
Fair/Good	0.5	20
Bad	0.4	10

Source: Road Inventory Survey, Screen Line Survey and Travel Speed Survey in 2017

**(8) Base Year Calibration**

Table 2.2.8 and Figure 2.2.5 show the results of screen line (SL) comparison of the Master Plan. It indicates that the ratio of traffic count survey results (observed trips) and estimated trips by transport model on screen line fall within an acceptable range of error at 10%.

**Table 2.2.8 Screen Line Comparison (PCU/day)**

Screen Line	Direction	Observed Trips	Estimated Trips	Ratio (%)
SL A	Both	311,333	287,878	92.0 %
SL B	Both	335,747	316,870	94.4 %

Source: The Study Team



Source: The Study Team

**Figure 2.2.5 Compared Screen Lines**

### **2.2.3 Future Road and Public Transport Network**

Future road and public transport network development for the future transport demand projection of this study is assumed to be conservative based on information and advice from such authorities as OVD, OR, ACGT and CI. The assumed development projects are as follows:

- 2024
  - On-going Projects in 2018,
  - Committed Projects, and
  - Short-term Projects of the Master Plan which do not require large scale land acquisition
- 2027
  - 2024 network plus remaining Short-term Projects and a part of Mid-term Projects

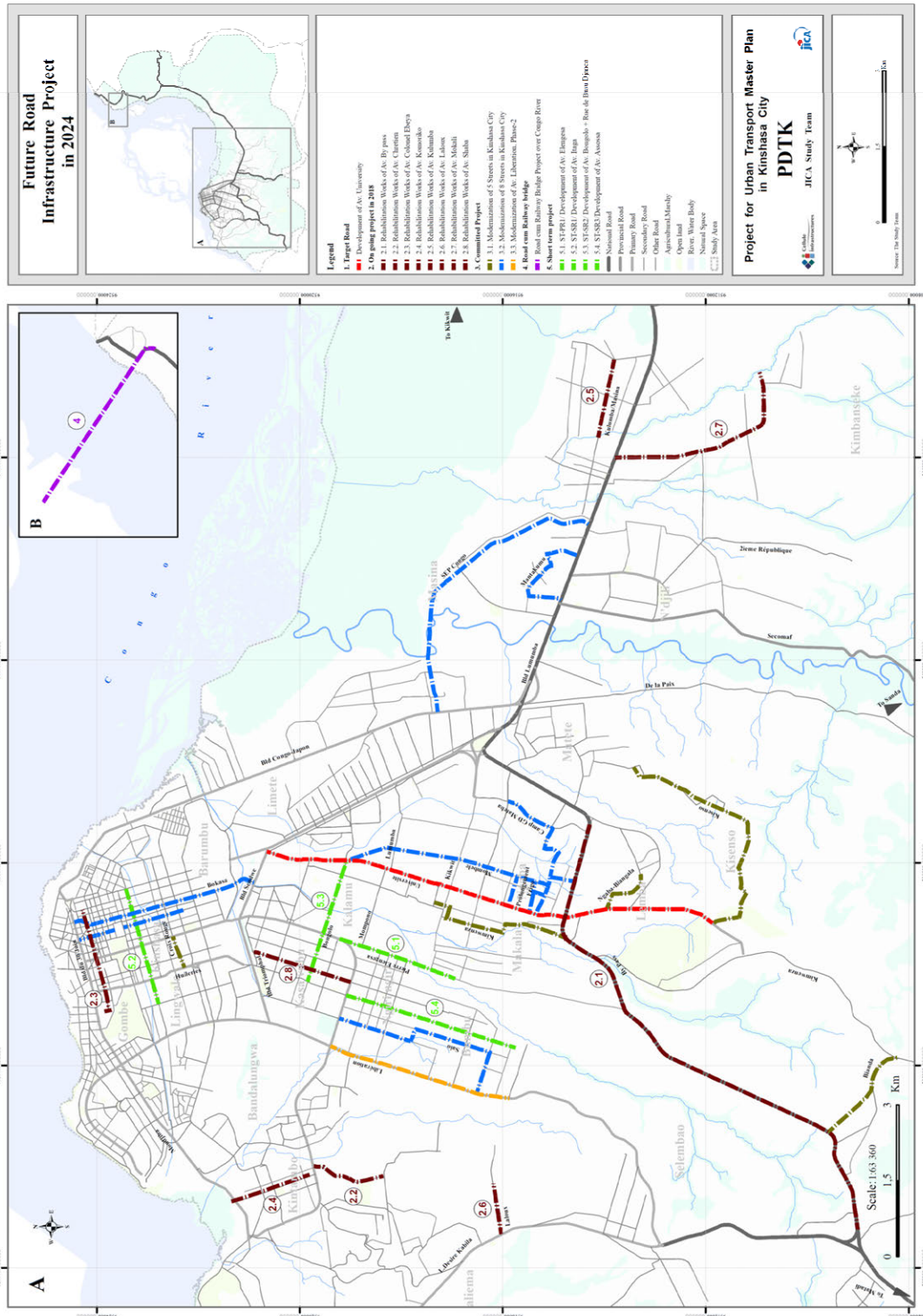
#### **(1) Road Network**

Table 2.2.9 shows the assumed projects for route assignment, and they are illustrated in Figure 2.2.6 and Figure 2.2.9.

**Table 2.2.9 List of Road Projects in the Route Assignment**

	<b>Project Name</b>	<b>Road Name</b>	<b>2024</b>	<b>2027</b>
On-going Projects	Road Widening from 2-lane to 4-lane	Bypass Avenue	✓	✓
		Rehabilitation-Works		
		Chretien Avenue	✓	✓
		Colonnel Ebeya Avenue	✓	✓
		Komoriko Avenue	✓	✓
		Kulumba Avenue	✓	✓
		Laloux Avenue	✓	✓
		Mokali Avenue	✓	✓
	Shaba Avenue	✓	✓	
Committed Projects	Modernization of 5 streets in Kinshasa City Project	Croix Rouge Avenue	✓	✓
		Kimwenza Avenue	✓	✓
		Ngaba – Biangala Avenue	✓	✓
		Transversale Bianda Avenue	✓	✓
		Kisenso Avenue	✓	✓
	Modernization of 8 streets in Kinshasa City Project	Saio Avenue	✓	✓
		Camp GD – Mateba Avenue	✓	✓
		Plateau Avenue	✓	✓
		Bokassa Avenue	✓	✓
		Sep Congo Avenue	✓	✓
		Matankumu Avenue	✓	✓
		Mombebe – Kahemba Avenue	✓	✓
	Road cum Railway Bridge project over Congo River between Kinshasa and Brazzaville	Prolongment Frigo Avenue	✓	✓
		Kinshasa and Brazzaville Bridge		
	Modernization of Liberation Boulevard, Phase2	Liberation Avenue	✓	✓
Short-term Projects of the Master Plan	Enhancement of Mobility Function of Road Network /Development	Elengesa Avenue (Partial development)	✓	✓
		Itaga Avenue	✓	✓
		Bongolo Avenue + Busu Djanoa Rue	✓	✓
		Assossa Avenue	✓	✓
Mid-term Projects of the Master Plan	Enhancement of Mobility Function of Road Network /Development	Lumumba Boulevard	-	✓
		Kasa-Vubu Avenue	-	✓
		Triumphal Boulevard	-	✓
		University Avenue	-	✓
		Elengessa Avenue	-	✓

Source: The Study Team



Source: The Study Team

**Figure 2.2.6 Future Road Network in 2024**



## (2) Public Transport Network

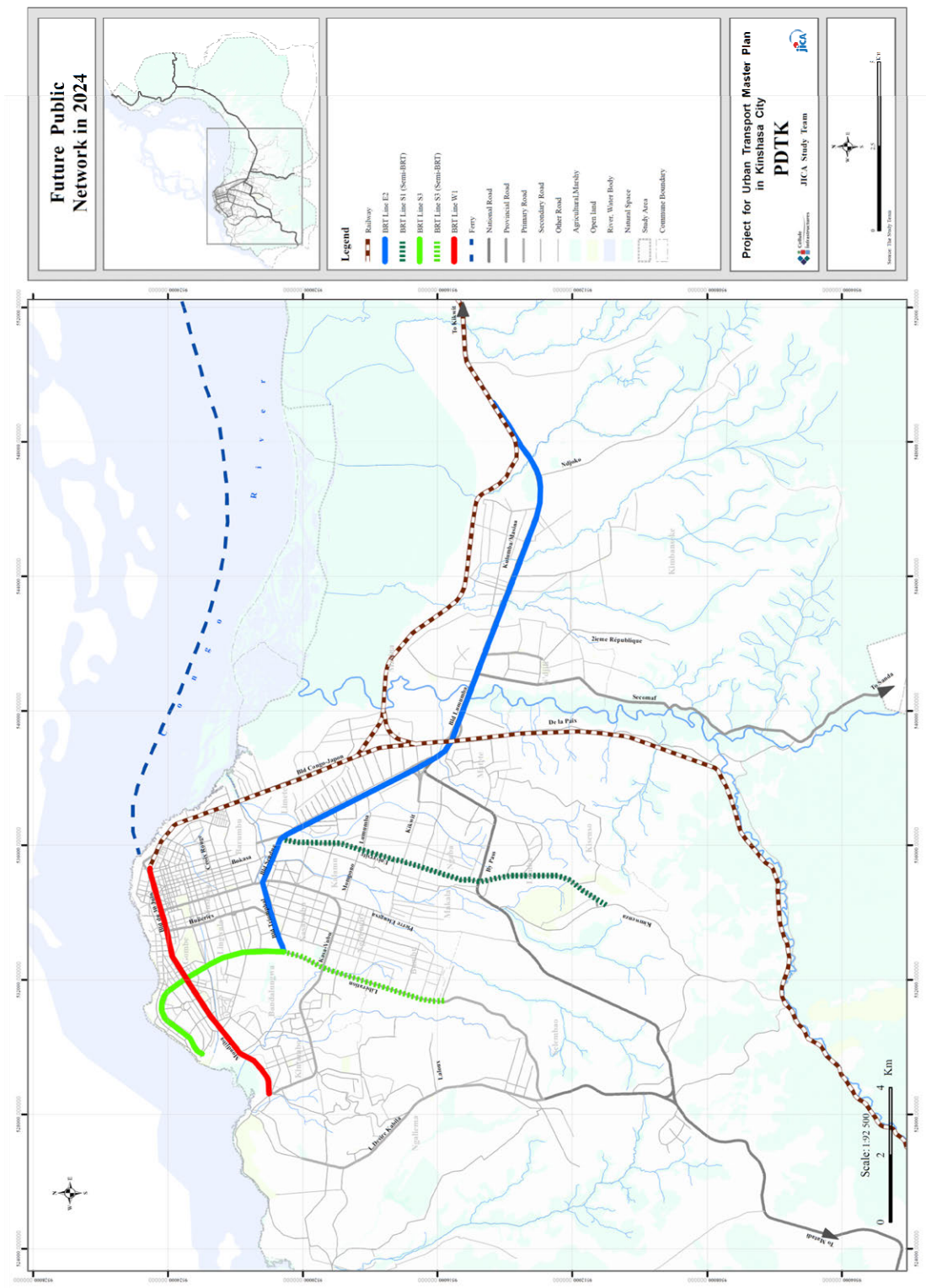
The Master Plan proposes to develop BRT, inland waterway service, railway projects and re-routing of bus operations. Also, the DRC government is intensively promoting “Kinshasa-Ilebo Railway Project” and “Road cum Railway Bridge Project over Congo River between Kinshasa and Brazzaville” as international strategic projects. Considering these government intentions, public transport networks in 2024 and 2027 are assumed as listed in Table 2.2.10 and they are illustrated in Figure 2.2.8 and Figure 2.2.9.

**Table 2.2.10 List of Public Transport Projects in the Route Assignment**

	Transport Mode	Target Route	2024	2027
Committed Projects	Railway	Kinshasa-Ilebo	✓	✓
		Kinshasa and Brazzaville	✓	✓
Short-term Projects of the Master Plan	Railway	South Line (Kasangulu Line)	✓	✓
		Airport Line	✓	✓
	BRT	E1 Route	-	✓
		E2 Route	Partial	✓
		S1 Route	Opening*	✓
		S2 Route	-	✓
		S3 Route	✓	✓
	W1 Route	✓	✓	
Ferry	CBD (Ngobila Beach) – Kinkole Port	✓	✓	

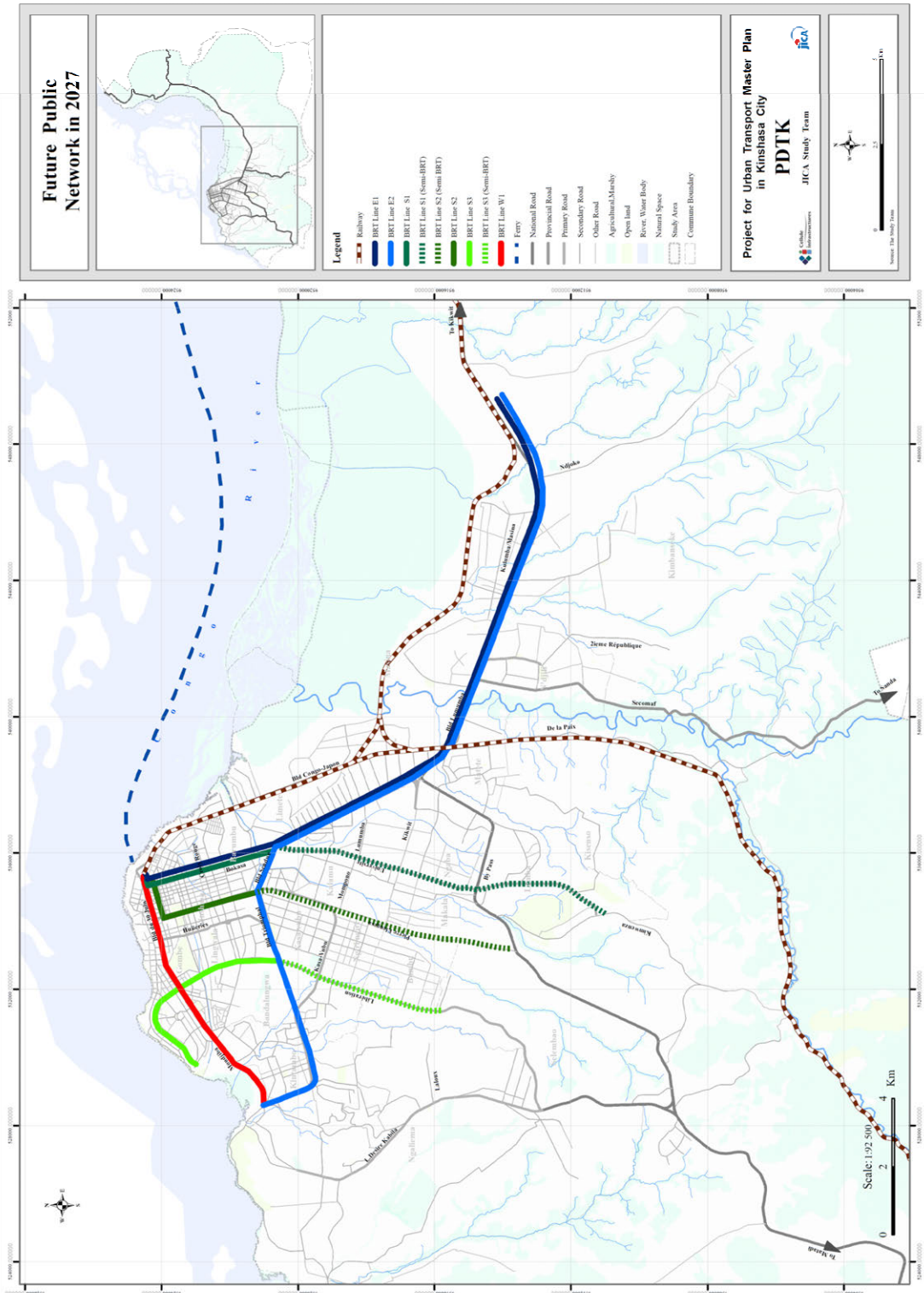
Note: E2 and S1 routes in 2024 exclude section which relates land acquisition of military land and N'Dolo Airport

Source: The Study Team



Source: The Study Team

**Figure 2.2.8 Future Public Transport Network in 2024**



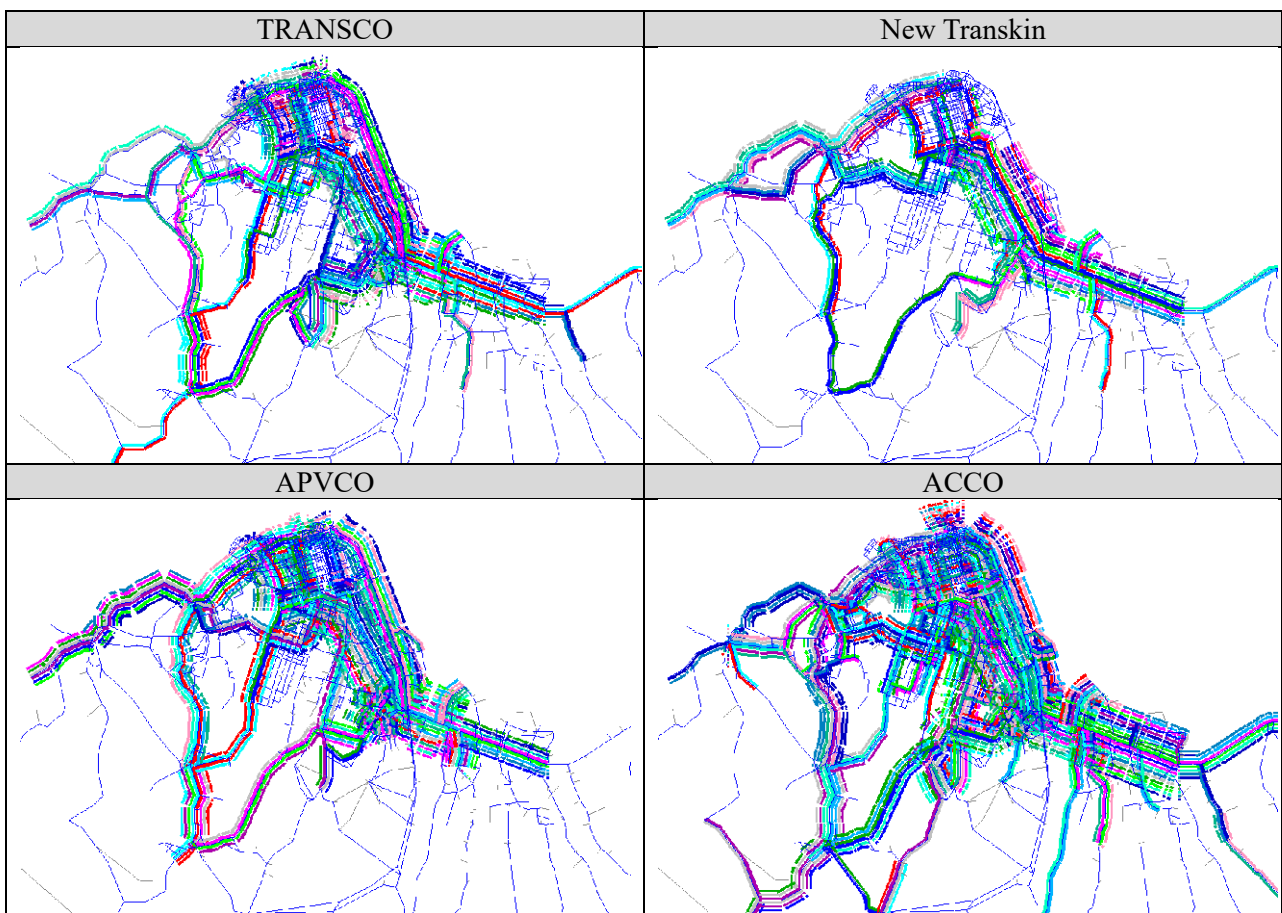
Source: The Study Team

**Figure 2.2.9 Future Public Transport Network in 2027**



The current bus networks of Transco, NewTranskin, APVCO and ACCO are assumed to remain in the future except for the case competitive to future public transport projects. The competitive bus routes should be replaced by the planned future public transport. In addition, it is assumed that half of the current taxi users will shift to future public transport modes such as BRTs, railways or inland waterway services as proposed in the Master Plan.

Figure 2.2.10 shows an example of the current bus route by operators. The current bus network and operation are summarized in the Master Plan based the bus route survey and collected bus operation data. Approximately 360 routes and their frequencies, fare and capacity were inputted as the bus network data.



Source: The Study Team

**Figure 2.2.10 Example of Public Transport Network**

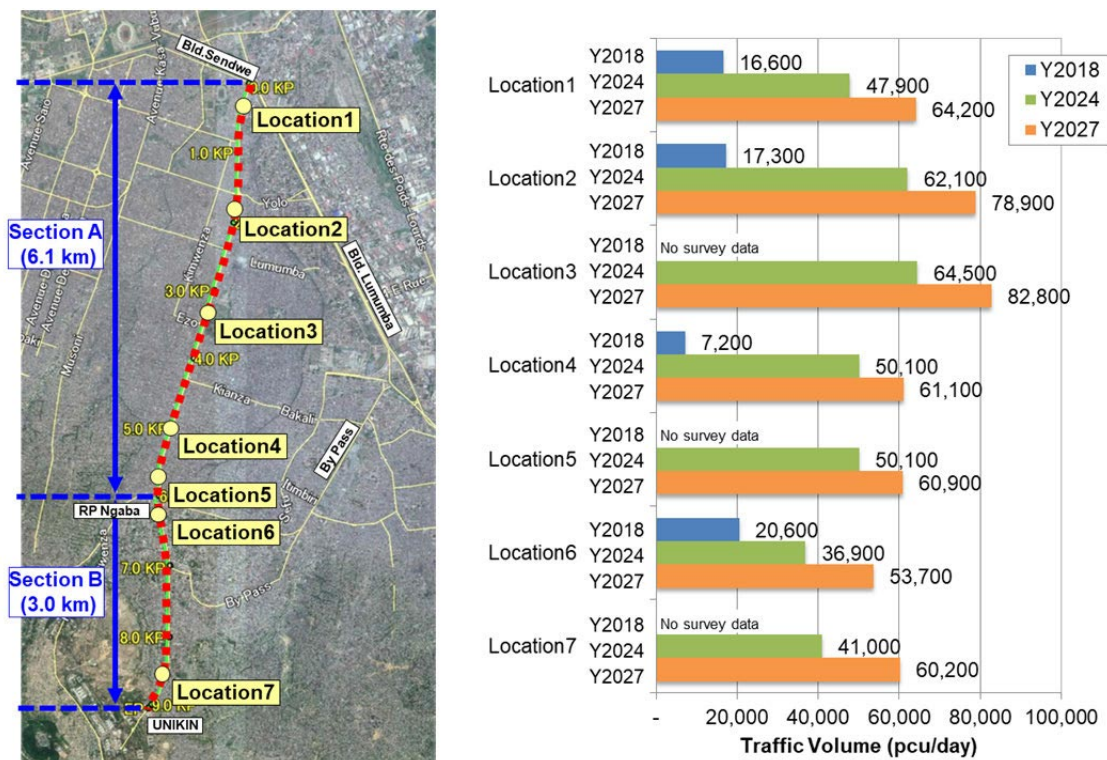
## 2.2.4 Projected Future Transport Demand

Future transport demand on University Avenue was projected based on the previously mentioned socioeconomic framework, road and public transport networks and other assumptions.

### (1) Case 1: 4-lane development

Figure 2.2.11 and Table 2.2.11 show projected daily traffic volume and composition on University Avenue. It is estimated that the maximum traffic volume of Section A is estimated as 64,500 in 2024 and it will increase up to 82,800 in 2027. The maximum traffic volume of Section B is 41,000 pcu/day in 2024, which will increase up to 60,200 pcu/day in 2027.

The projected traffic volumes of Sections A and B reveal that they will exceed the 4-lane road capacity of 39,100 pcu/day even in the opening year of 2024. Thus, an additional countermeasure is essential to alleviate traffic congestion on University Avenue, such as road widening, development of other north-south roads, or a promotive policy of modal shift from private mode to public transport.



Source on the left: Google, Digital Globe taken on the 6th March, 2018, edited by the Study Team

Source on the right: The Study Team

**Figure 2.2.11 Projected Traffic Volume on University Avenue (Case 1)**

**Table 2.2.11 Summary of Traffic Volume (Case 1)**

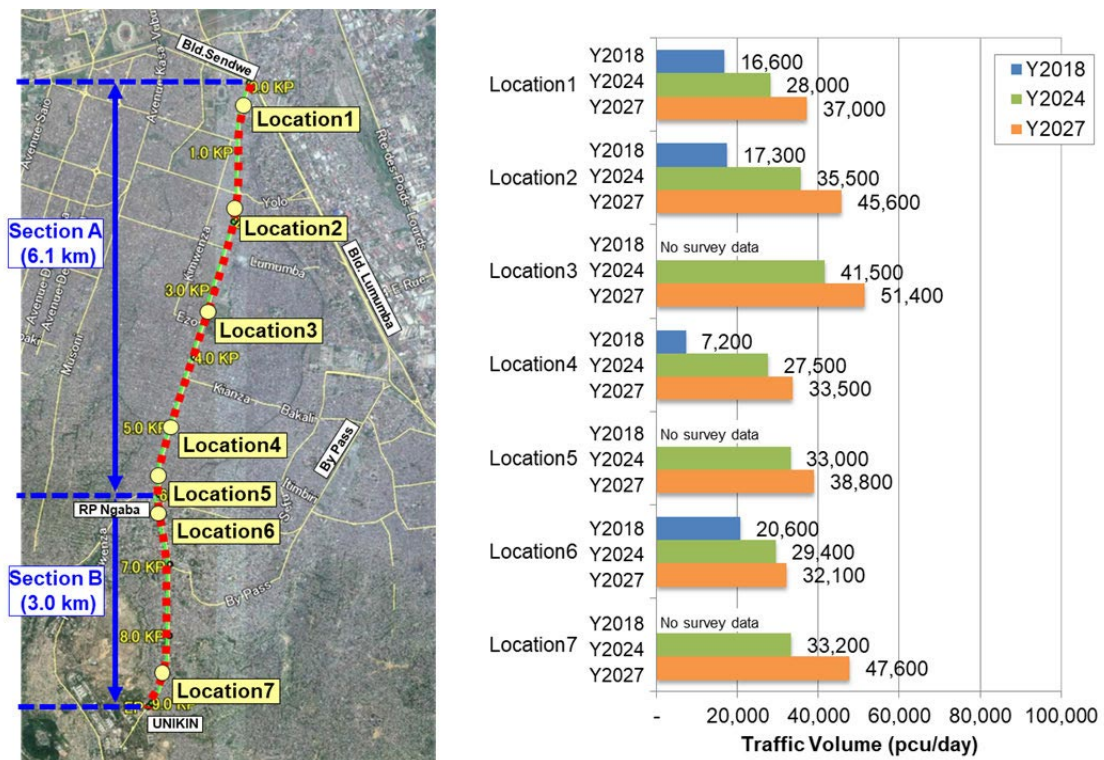
Location		Transport Mode	Traffic Volume (pcu/day)		Composition (%)	
			2024	2027	2024	2027
Section A	Location1	Motorcycle	6,800	8,300	14.2%	12.9%
		Car	34,600	49,000	72.2%	76.3%
		Public Transport	4,800	6,000	10.0%	9.3%
		Truck	1,700	900	3.5%	1.4%
		Total	47,900	64,200	100.0%	100.0%
	Location2	Motorcycle	10,900	12,400	17.6%	15.7%
		Car	44,700	58,500	72.0%	74.1%
		Public Transport	4,600	5,800	7.4%	7.4%
		Truck	1,900	2,200	3.1%	2.8%
		Total	62,100	78,900	100.0%	100.0%
	Location3	Motorcycle	11,700	13,300	18.1%	16.1%
		Car	46,300	61,400	71.8%	74.2%
		Public Transport	4,600	5,800	7.1%	7.0%
		Truck	1,900	2,300	2.9%	2.8%
		Total	64,500	82,800	100.0%	100.0%
	Location4	Motorcycle	8,700	10,000	17.4%	16.4%
		Car	35,200	43,800	70.3%	71.7%
		Public Transport	4,600	5,800	9.2%	9.5%
		Truck	1,600	1,500	3.2%	2.5%
		Total	50,100	61,100	100.0%	100.0%
Location5	Motorcycle	8,700	10,100	17.4%	16.6%	
	Car	35,100	43,400	70.1%	71.3%	
	Public Transport	4,600	5,800	9.2%	9.5%	
	Truck	1,700	1,600	3.4%	2.6%	
	Total	50,100	60,900	100.0%	100.0%	
Section B	Location6	Motorcycle	7,900	10,800	21.4%	20.1%
		Car	24,000	36,400	65.0%	67.8%
		Public Transport	4,900	6,300	13.3%	11.7%
		Truck	100	200	0.3%	0.4%
		Total	36,900	53,700	100.0%	100.0%
	Location7	Motorcycle	9,900	14,400	24.1%	23.9%
		Car	24,900	38,200	60.7%	63.5%
		Public Transport	6,100	7,500	14.9%	12.5%
		Truck	100	100	0.2%	0.2%
		Total	41,000	60,200	100.0%	100.0%

Source: The Study Team

**(2) Case 2: Two-lane development**

Figure 2.2.12 and Table 2.2.12 show the projected daily traffic volume and composition on University Avenue. It is estimated that the maximum traffic volume of Section A is 41,500 pcu/day in 2024, which will increase up to 51,400 pcu/day in 2027. The maximum traffic volume of Section B is 33,200 pcu/day in 2024 and it will increase up to 47,600 pcu/day in 2027.

The projected traffic volume of both Section A and B exceeds the two-lane road capacity of 20,500 pcu/day even in the opening year of 2024. It indicates that additional countermeasures are required to alleviate traffic congestion on University Avenue, such as road widening, development of other north-south roads, or a promotive policy to shift from private to public transport modes.



Source on the left: Google, Digital Globe taken on the 6th March, 2018, edited by the Study Team

Source on the right: The Study Team

**Figure 2.2.12 Projected Traffic Volume on University Avenue (Case 2)**

**Table 2.2.12 Summary of Traffic Volume (Case 2)**

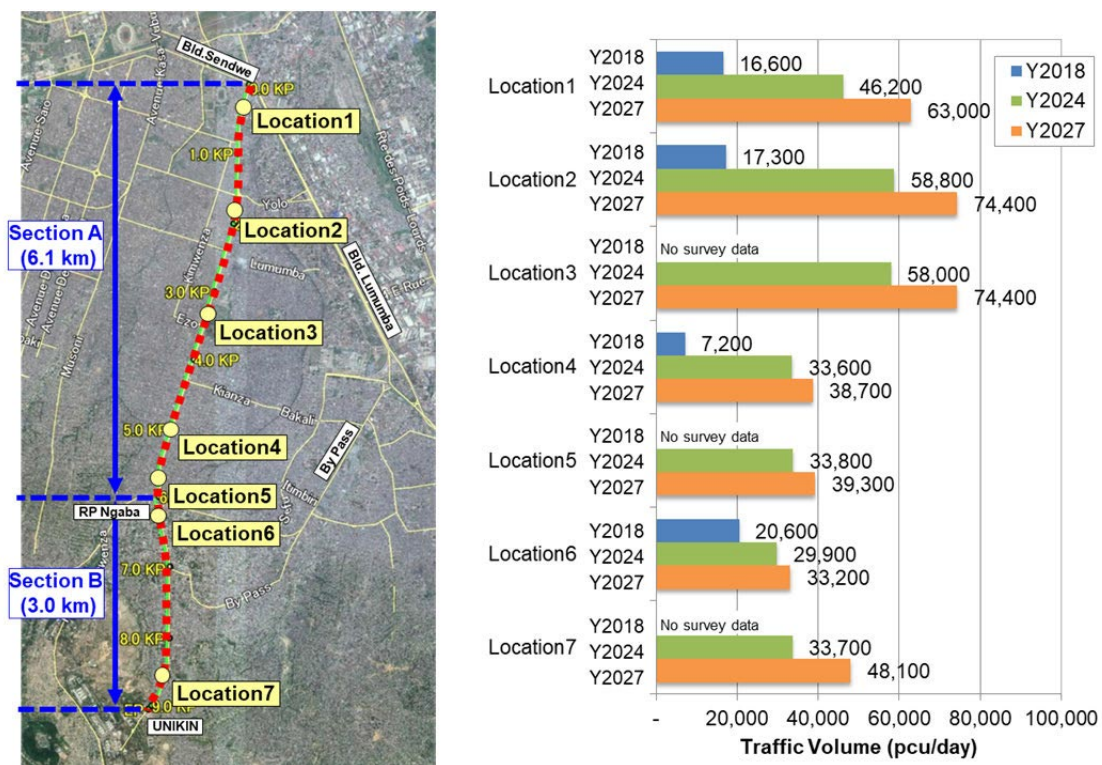
Location		Transport Mode	Traffic Volume (pcu/day)		Composition (%)	
			2024	2027	2024	2027
Section A	Location1	Motorcycle	3,500	4,500	12.5%	12.2%
		Car	19,200	25,900	68.6%	70.0%
		Public Transport	4,800	6,000	17.1%	16.2%
		Truck	500	600	1.8%	1.6%
		Total	28,000	37,000	100.0%	100.0%
	Location2	Motorcycle	6,000	7,000	16.9%	15.4%
		Car	24,400	31,700	68.7%	69.5%
		Public Transport	4,600	5,800	13.0%	12.7%
		Truck	500	1,100	1.4%	2.4%
		Total	35,500	45,600	100.0%	100.0%
	Location3	Motorcycle	7,400	8,200	17.8%	16.0%
		Car	29,000	36,100	69.9%	70.2%
		Public Transport	4,600	5,800	11.1%	11.3%
		Truck	500	1,300	1.2%	2.5%
		Total	41,500	51,400	100.0%	100.0%
	Location4	Motorcycle	4,700	5,600	17.1%	16.7%
		Car	17,800	21,600	64.7%	64.5%
		Public Transport	4,600	5,800	16.7%	17.3%
		Truck	400	500	1.5%	1.5%
		Total	27,500	33,500	100.0%	100.0%
Location5	Motorcycle	5,600	6,600	17.0%	17.0%	
	Car	22,200	25,500	67.3%	65.7%	
	Public Transport	4,600	5,800	13.9%	14.9%	
	Truck	600	900	1.8%	2.3%	
	Total	33,000	38,800	100.0%	100.0%	
Section B	Location6	Motorcycle	6,000	6,600	20.4%	20.6%
		Car	18,400	19,100	62.6%	59.5%
		Public Transport	4,900	6,300	16.7%	19.6%
		Truck	100	100	0.3%	0.3%
		Total	29,400	32,100	100.0%	100.0%
	Location7	Motorcycle	7,900	12,100	23.8%	25.4%
		Car	19,100	27,900	57.5%	58.6%
		Public Transport	6,100	7,500	18.4%	15.8%
		Truck	100	100	0.3%	0.2%
		Total	33,200	47,600	100.0%	100.0%

Source: The Study Team

### (3) Case 3: 4-lane and 2-lane development

Figure 2.2.13 and Table 2.2.13 show projected daily traffic volume and composition on University Avenue. It is estimated that the maximum traffic volume of Section A is 58,800 pcu/day in 2024 and it will increase up to 74,400 pcu/day in 2027. The maximum traffic volume of Section B is 33,700 pcu/day in 2024, which will increase up to 48,100 pcu/day in 2027.

The projected traffic volume on University Avenue exceeds either the planned 4-lane or 2-lane road capacities of 39,100 pcu/day and 20,500 pcu/day, respectively, even in the opening year of 2024. This implies that additional countermeasures are essential to alleviate traffic congestion on University Avenue, such as road widening, development of other north-south roads, or a promotive policy to shift from private to public transport modes.



Source on the left: Google, Digital Globe taken on the 6th March, 2018, edited by the Study Team

Source on the right: The Study Team

**Figure 2.2.13 Projected Traffic Volume on University Avenue (Case 3)**

**Table 2.2.13 Summary of Traffic Volume (Case 3)**

Location		Transport Mode	Traffic Volume (pcu/day)		Composition (%)	
			2024	2027	2024	2027
Section A	Location1	Motorcycle	6,400	8,000	13.9%	12.7%
		Car	33,300	47,600	72.1%	75.6%
		Public Transport	4,800	6,000	10.4%	9.5%
		Truck	1,700	1,400	3.7%	2.2%
		Total	46,200	63,000	100.0%	100.0%
	Location2	Motorcycle	10,400	11,600	17.7%	15.6%
		Car	42,200	55,000	71.8%	73.9%
		Public Transport	4,600	5,800	7.8%	7.8%
		Truck	1,600	2,000	2.7%	2.7%
		Total	58,800	74,400	100.0%	100.0%
	Location3	Motorcycle	10,400	11,900	17.9%	16.0%
		Car	41,400	54,700	71.4%	73.5%
		Public Transport	4,600	5,800	7.9%	7.8%
		Truck	1,600	2,000	2.8%	2.7%
		Total	58,000	74,400	100.0%	100.0%
	Location4	Motorcycle	5,600	6,500	16.7%	16.8%
		Car	22,500	25,700	67.0%	66.4%
		Public Transport	4,600	5,800	13.7%	15.0%
		Truck	900	700	2.7%	1.8%
		Total	33,600	38,700	100.0%	100.0%
Location5	Motorcycle	5,600	6,600	16.6%	16.8%	
	Car	22,600	26,000	66.9%	66.2%	
	Public Transport	4,600	5,800	13.6%	14.8%	
	Truck	1,000	900	3.0%	2.3%	
	Total	33,800	39,300	100.0%	100.0%	
Section B	Location6	Motorcycle	6,100	6,700	20.4%	20.2%
		Car	18,800	20,100	62.9%	60.5%
		Public Transport	4,900	6,300	16.4%	19.0%
		Truck	100	100	0.3%	0.3%
		Total	29,900	33,200	100.0%	100.0%
	Location7	Motorcycle	8,000	12,100	23.7%	25.2%
		Car	19,500	28,400	57.9%	59.0%
		Public Transport	6,100	7,500	18.1%	15.6%
		Truck	100	100	0.3%	0.2%
		Total	33,700	48,100	100.0%	100.0%

Source: The Study Team

## **CHAPTER 3    Alternative Typical Cross Sections**

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### **3.1    Setting of Alternative Typical Cross Sections**

#### **3.1.1    Basic Composition of Typical Cross Section**

The basic typical cross section of the project road is proposed referring to the geometric design standard of AASHTO, that of Japan as well as that of DRC. The geometric parameters in principle are adopted from the Japanese standard of “Explanations and Applications of the Operation and Commentary of the Japanese Road Structure Ordinance”, since the project road is characterized similar to the road classification Class 4-Type 1 defined by the Japanese standard, which is a general urban trunk road planned at a design speed of 60 km/hr.

According to the configuration of the road width shown in the Japanese standard, the maximum width of carriage-way is 3.25m for urban trunk road, the width of shoulder is 0.5m and the width of median strip is 3.0m that could be used for the additional lane width for the exclusive use of the left turning traffic at the intersection.

Currently, the Japanese standard provides that the minimum width of the sidewalk should be 2.0m in the view of barrier-free concept and wheelchair users. Further, it provides that the width will be expanded to 3.5m for the frequent pedestrian flows. Basically, the width of the sidewalk is not determined by the traffic volume-based road classification, but according to the local condition.

In previous Japanese standard, the required width of a pedestrian was considered to be 0.75m, and thus the minimum sidewalk width was set at 1.5m. However, the sidewalk width of 2m is considered appropriate, when considering the physique of a general Congolese and the experience of Congo-Japon Boulevard, which adopted the 2.0m sidewalk width, is observed functioning adequately.

#### **3.1.2    Setting of Alternative Cross Sections**

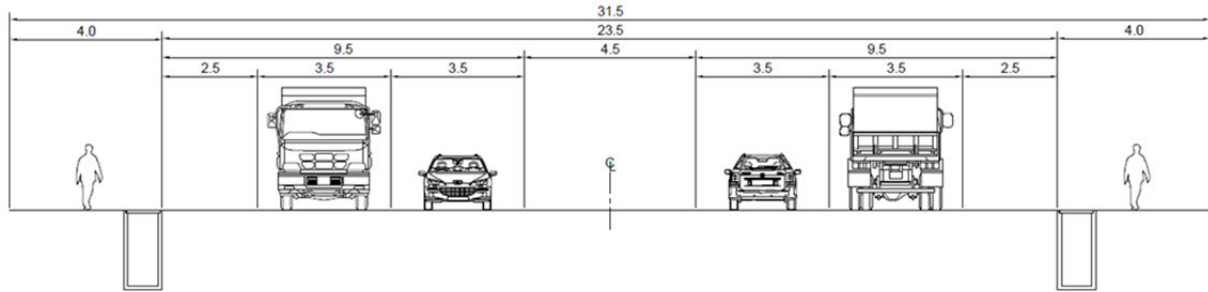
The typical cross section of the road consists of carriage-way, shoulder and sidewalk in principle. The carriage-way of the project road is recommended to be 4-lane in both directions due to the traffic demand for whole sections of the project road. However, if the 4-lane carriage-way is fully implemented throughout the road, certain sections of the road will have quite a large negative impact on shops and residential buildings located along the narrow and densely developed sections. As such, some sections will have to be constructed as the 2-lane road.

In case where the 4-lane carriage-way is implementable, it is desirable to construct a median strip that will provide left-turning traffic with an additional lane at the intersection. Side drainages can be installed as part of the sidewalk component with appropriate stable cover.

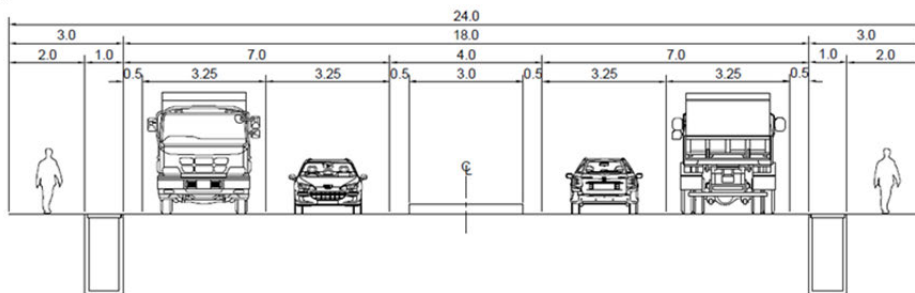
Based on Section 3.1.1 and land availability as mentioned above, alternatives on the typical cross section can be proposed as shown in Figure 3.1.1 and Figure 3.1.2.



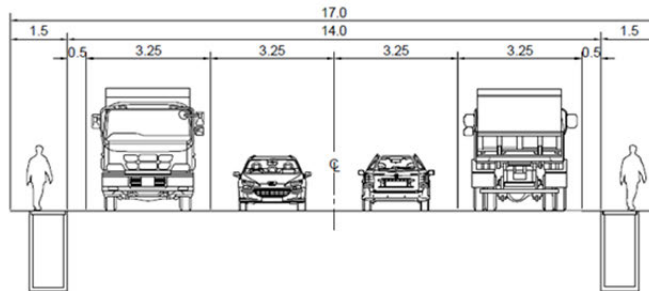
**W=31.5m : Master Plan Recommendation**



**W=24.0m**



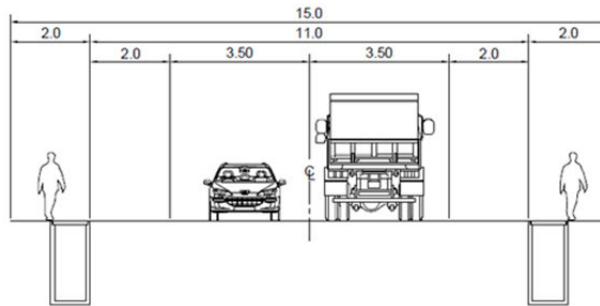
**W=17.0m : Minimization of Resettlement**



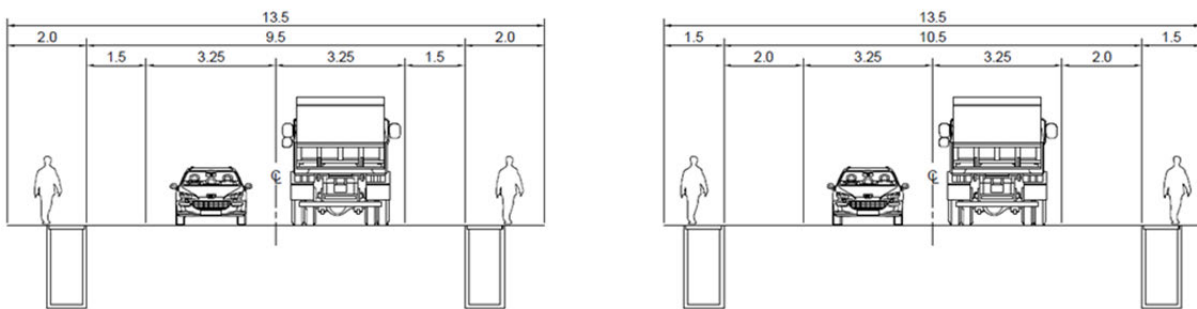
Source : The Study Team

**Figure 3.1.1 The Typical Cross Section of a 4-lane Road**

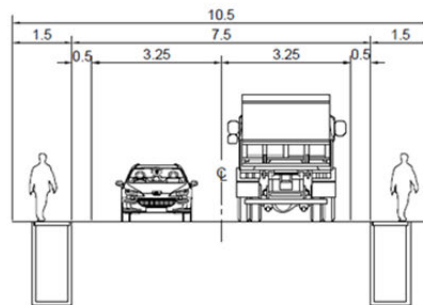
**W=15.0m : OR Standard**



**W=13.5m**



**W=10.5m : Minimization of Resettlement**



Source: The Study Team

**Figure 3.1.2 The Typical Cross Section of a 2-lane Road**

The details of each typical section are described as follows:

< 4-lane >

W=31.5 m (Master Plan Recommendation):

This cross sectional configuration follows the Master Plan recommendation as a primary 4-lane urban road (design speed at 80 km/h in rural areas). This proposal is based on the design standard of AASHTO, Japan as well as DRC.

W=24.0 m:

While narrowing down the lane width from 3.5m to 3.25m, which is adopted for Congo-Japon Boulevard, 3.0m of the median strip and 2.0m of the sidewalk width is secured to meet the Japanese geometric standard of urban roads.

Further, this alternative assures the safety and space of pedestrians by adding another 1.0m width of the covered side drainage facility.

The median strip needs a minimum width of 3.0m necessary for separating the left-turn lane, a separation mount width of 0.5m, and a marginal strip of 0.25m on both sides at the intersection to provide a total width of 4.0m. If the left-turn lane is set to be less than 3m, it will not be able to cover the width of a truck.

W=17.0 m (Minimization of Resettlement):

This cross section is the minimum width configuration required as a primary 4-lane urban road. The width of the carriage-way is set to be the standard lane width of 3.25m as adopted for the urban area of Japan, and this is consistent with the road width and road shoulder width of the Congo-Japon Boulevard which was completed in recent years as a Japanese grant aid project. The sidewalk width of 1.5m is the minimum width stipulated in the old Japanese geometric standard. Therefore, the side drainage is basically installed inside the sidewalk space with appropriate stable cover lid.

< 2-lane >

W=15.0 m (OR Standard):

This is a standard cross section of OR with lane width of 3.5m and shoulder width of 2.0m so as to minimize as much as possible obstacles to the main road traffic flow. The sidewalk width is set to be 2.0m to keep the safety of the pedestrian, which is the minimum sidewalk width applied to the urban road by the current Japan standard.

W=13.5 m:

If the above-mentioned road width of 15.0m cannot be secured, there are two options depending on whether the priority is given to the shoulder space or the sidewalk width. According to Japanese standard, the minimum sidewalk width of the urban road should be 2.0m and thus the shoulder width is confined to 1.5m within the total road width of 13.5m. If the priority is given to convenience to the traffic flow, the shoulder width can be 2.0m and the sidewalk width will be reduced to 1.5m. Considering the frequency of loading and unloading activities along the road for trucks and such public transportation as taxi and bus, it is judged preferable to set the shoulder width to be 2.0m.

If both the shoulder and sidewalk spaces should be provided with 2m in width, the total road width will become 14.5m. This could be the same standard cross section of 15.0m stipulated in the OR standard.

**W=10.5 m (Minimization of Resettlement):**

This cross section is the most minimized configuration that attains the lane width of 3.25m by eliminating the vehicular stop zone and minimizing the sidewalk width to 1.5m, which is the lowest standard as the primary urban road stipulated in the old Japanese standard. For the current road improvement plan, it should be avoided as much as possible. Basically, the drainage gutter is to be installed inside of the sidewalk space with the lid.

Options of the alternative typical cross sections are compared as configured in Table 3.1.1.

**Table 3.1.1 Options of Alternative Typical Cross Sections**

Option No.	Section A (BP - PK6.1 km)		Remarks
	A-1 (BP - PK3.5 km)	A-2 (PK3.5 - PK6.1 km)	
1	31.5 m	31.5 m	4-lane in whole section.
2	24 m	24 m	4-lane in whole section.
3	17 m	17 m	4-lane in whole section.
4	15 m	15 m	2-lane in whole section.
5	13.5 m	13.5 m	2-lane in whole section.
6	10.5 m	10.5 m	2-lane in whole section.
7	31.5 m	15 m	Combination with 4-lane and 2-lane
8	31.5 m	13.5 m	Combination with 4-lane and 2-lane
9	31.5 m	10.5 m	Combination with 4-lane and 2-lane

Source: The Study Team

The existing road width before and after PK3.5 km, i.e. at Yolo-Ezo IS change significantly. The section from BP to PK3.5 km is possible to set up 4-lane road with 31.5m width without major conflict along the roadside, except for initial 1 km. However, the section from PK3.5 km up to PK6.1 km, i.e. RP Ngaba shows difficulty to construct the 4-lane road without major land acquisition along the road, since the width of almost half of the section is less than 17m. Therefore, options 7, 8 and 9 are set up to achieve the maximum traffic capacity without major negative impact to the existing activities along the road.

## **3.2 Comparison of Optional Project Configurations**

### **3.2.1 Key Indicators**

The Pre-feasibility Study (Pre-F/S) on University Avenue aims to clarify the work required for the subsequent Feasibility Study (F/S) and contribute to its effective execution. Thus, the Pre-F/S examined several alternative plans combining options on the project length and road width. The Pre-F/S result exhibits possible options of the project plan to both DRC and Japanese governments to select most realistic plan(s) for the project implementation. The F/S will follow thereafter and carry out the engineering design work to pursue the project implementation.

In this context, comparison of optional project configuration was undertaken based on four key indicators using available data at this moment and results of minimum field surveys. The selected indicators are: 1) Projected Traffic Demand, 2) Project Cost, 3) Environmental Category, and 4) Cost borne by the DRC Government. The following is the overview of each indicator, and details of estimation method are described in the relevant chapters as introduced below:

- Projected Traffic Demand (Refer to Chapter 2)

According to the Master Plan, University Avenue is planned to be a 4-lane road entirely by the year 2030. However, the section from PK3.5 km to PK6.1 km has difficulty to construct the 4-lane road without major land acquisition which generally requires a long period of time. In addition, University Avenue near Yolo-Ezo IS has been closed due to heavy rain in October 2017 and detour traffic has caused traffic congestion to the parallel roads of University Avenue. In order to smooth the traffic flow, it is important to reconstruct University Avenue as fully functional. Therefore, in consideration of early project implementation, projected traffic demand was selected as a key indicator which implies necessary number of lanes in the earlier 2020's.

- Project Cost (Refer to Chapter 5)

As a key indicator, preliminary project cost was selected. The project cost composed of construction cost, detail design (D/D) and construction supervision (C/S) costs. In this Study, all types of taxes are excluded from the project cost as the principle of the Japanese ODA scheme. Also, it should be noted that five percent of contingency is deemed necessary in Chapter 5. However, this is excluded in the comparison of project cost since the exact rate of contingency will be decided at a later stage.

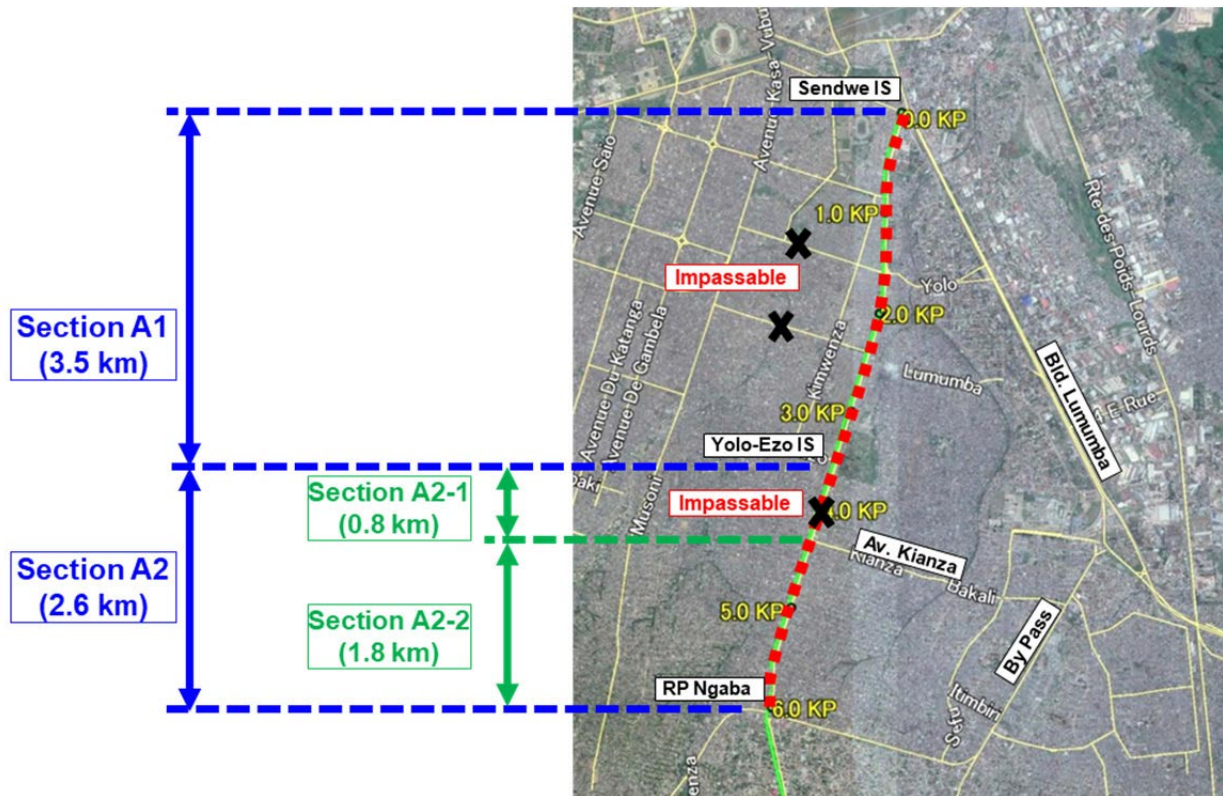
- Environmental Category (Refer to Chapter 7)

In terms of environmental category, it is mainly depending on size of relocation in accordance with JICA Guidelines for Environmental and Social Considerations (April 2010). The necessary period of procedure for the project implementation is different depending on the environmental category of the project which is defined mainly by the magnitude of involuntary resettlement. Thus, this indicator was selected as a key indicator for the comparison.

- Costs borne by the DRC Government (Refer to Chapter 6)

In principle, utility relocation costs (both overhead and underground), land acquisition cost, compensation cost and resettlement cost have to be borne by the DRC government, even in the case of Japanese grant aid project. However, there is a concern that implementation of the project would be delayed, if DRC government needs to shoulder a huge amount of the cost. In this context, this cost indicator was selected as one of the key indicators.

The indicators mentioned above were basically estimated by two road sections, namely Section A1 (Sendwe IS – Yolo Ezo IS) and Section A2 (Yolo Ezo IS – RP Ngaba) in consideration of characteristics of the existing carriageway and roadside situations. However, it should be noted that some indicators of Section A2 were further divided into Section A2-1 (Yolo Ezo IS – Kianza Avenue) and Section A2-2 (Kianza Avenue – RP Ngaba) taking into account the connectivity with the relevant network. Section setting is illustrated in Figure 3.1.2.



Source: Google, Digital Globe taken on the 6th March, 2018, edited by the Study Team

**Figure 3.2.1 Section Setting of Section A**

### 3.2.2 Comparison of Optional Project Configurations

Based on the key indicators and section settings mentioned above, multi-criteria comparison has been made among the optional project configurations. Table 3.2.1, Table 3.2.2 and Table 3.2.3 show the comparison of 4-lane options, 2-lane options, and the combination of 4-lane and 2-lane options, respectively. The summary of findings according to the indicators is as follows.

- Projected daily traffic volumes of Section A1 in 2024 range from 48,000 to 64,000 pcu/day for 4-lane option, from 28,000 to 42,000 pcu/day for 2-lane option, and from 46,000 to 59,000 pcu/day for the combination of 4-lane and 2-lane options. The traffic volume of Section A2 is estimated to be around 50,000 pcu/day for the 4-lane option, 28,000 to 33,000 pcu/day for the 2-lane option, and around 34,000 pcu/day for the combination of 4-lane and 2-lane options. The projected traffic volume of all the options will exceed their road capacity even in the opening year of 2024.
- Considering the high transport demand and important functions of University Avenue as a backbone of transport network in the Study Area, early project implementation is preferable. In case 4-lane option requires long periods due to large scale of land acquisition and financial constraints, 2-lane option is considered as a feasible option to connect current missing link and avoid further traffic congestion. In addition, additional countermeasures are essential to alleviate traffic congestion, such as road widening, development of other north-south roads, promotive policy of modal shift from private mode to public transport.

- The preliminary cost estimates of 4-lane options are 52.3 million USD for option 1 (31.5m width), 44.5 million USD for option 2 (24.0 m width) and 42.2 million USD for option 3 (17.0 m width). Those of 2-lane options are 38.5 million USD for option 4 (15.0 m width), 37.1 million USD for option 5 (13.5 m width) and 33.2 million USD for option 6 (10.5 m width). Those of the combination of 4-lane and 2-lane options are 44.1 million USD for option 7 (31.5 m+10.5 m widths), 39.6 million USD for option 8 (24.0 m+10.5 m widths) and 38.4 million USD for option 9 (17.0 m+10.5 m widths).
- Considering the affected areas along University Avenue, option 1 and 2 are deemed as “Category A”, option 3, 4 and 5 are deemed as “Category A or B”, and Option 6, 7, 8 and 9 are deemed as “Category B”, in accordance with JICA Guidelines for Environmental and Social Considerations (April 2010). It should be noted that this is a preliminary estimation based on counting the likely structures affected by the project using the satellite imagery. Thus, it is necessary to conduct EIA study to identify accurate environmental category. At this moment, Category B, option is preferable from the view point of early project implementation.
- In terms of the cost borne by the DRC government, preliminary cost estimations of 4-lane options are 21.9 million USD for option 1, 9.45 million USD for option 2 and 2.48 million USD for option 3. The costs of 2-lane options are 1.43 million USD for option 4, 1.01 million USD for option 5 and 0.70 million USD for option 6. The costs of the combination of 4-lane and 2-lane options are 1.88 million USD for option 7, 1.24 million USD for option 8 and 0.76 million USD for option 9. The comparison result indicates that a huge amount of the costs of 4-lane options will be brought about by the land acquisition cost and compensation cost of Section A2.

**Table 3.2.1 Comparison of 4-lane Options**

Option Number		Option 1: 31.5m in width (as Proposed by the MP)	Option 2: 24.0m in width	Option 3: 17.0m in width (Required minimum width)
Road Width	Section A1 (BP - PK3.5)	31.5m	24.0m	17.0m
	Section A2-1 (PK3.5 - PK4.3)			
	Section A2-2 (PK4.3 - PK6.1)			
Projected Traffic Demand (2024)	Section A1 (BP - PK3.5)	48,000 ~ 64,000 pcu/day		
	Section A2-1 (PK3.5 - PK6.1)	Around 50,000 pcu/day		
Number of affected permanent structures and residents.  (See Note 1)	Section A1 (BP - PK3.5)	Total: About 26, including - Residential structures : 0 (None)	Total: About 12, including - Residential structures : 0 (None)	Total: About 3, including - Residential structures : 0 (None)
	Section A2-1 (PK3.5 - PK4.3)	Total : About 136, including - Residential structures : 16 (553 - 1,255 residents)	Total : About 107 including - Residential structures : 15 (250 - 1,236 residents)	Total : About 53, including - Residential structures : 8 (39 - 686 residents)
	Section A2-2 (PK4.3 - PK6.1)	Total : About 240, including - Residential structures : 17 (477 - 860 residents)	Total : About 179 including - Residential structures : 16 (179 - 831 residents)	Total : About 109, including - Residential structures : 9 (49 - 564 residents)
	Throughout Section A	Total : About 402, including - Residential structures: 33 (1,030 - 2,115 residents)	Total : About 298, including - Residential structures: 31 (429 - 2,067 residents)	Total : About 165, including - Residential structures: 18 (88 - 1,250 residents)
JICA Guideline Category (See Note 2)		A	A	A or B
Project Costs estimated by JST	Section A1 (BP - PK3.5)	US\$ 30 million	US\$ 25.5 million	US\$ 24.3 million
	Section A2-1 (PK3.5 - PK4.3)	US\$ 6.9 million	US\$ 5.9 million	US\$ 5.5 million
	Section A2-2 (PK4.3 - PK6.1)	US\$ 15.4 million	US\$ 13.1 million	US\$ 12.4 million
	Throughout Section A	US\$ 52.3 million (JPY 5.88 billion)	US\$ 44.5 million (JPY 5.00 billion)	US\$ 42.2 million (JPY 4.74 billion)
Cost borne by DRC  (See Note 3)	Underground Utility	US\$ 0.60 million	US\$ 0.60 million	US\$ 0.46 million
	Overhead Utility	US\$ 0.19 million	US\$ 0.19 million	US\$ 0.19 million
	Land Acquisition	US\$ 5.40 million	US\$ 2.13 million	US\$ 0.38 million
	Compensation	US\$ 14.45 million	US\$ 5.65 million	US\$ 0.98 million
	Resettlement	US\$ 1.25 million	US\$ 0.88 million	US\$ 0.46 million
	Throughout Section A	<b>US\$ 21.90 million</b> <b>(JPY 2.47 billion)</b>	<b>US\$ 9.45 million</b> <b>(JPY 1.06 billion)</b>	<b>US\$ 2.48 million</b> <b>(JPY 0.27 billion)</b>

Notes:

1. The figures in the parentheses indicate estimated number of affected residents. Assumed condition is that Low figures are "Area Sliced inside ROW boundary" and high figures are "Full Acquisition of Affected Structures"
2. Publication of EIA and RAP on JICA web-site and Review of JICA Expert Committee are mandatory.
3. Land Acquisition cost is calculated from area of building footprint

Source: The Study Team



**Table 3.2.2 Comparison of 2-lane Options**

Option Number		Option 4: 15.0m in width (OR Design Standards)	Option 5: 13.5m in width	Option 6: 10.5m in width (Required minimum width)
Road Width	Section A1 (BP - PK3.5)	15.0m	13.5m	10.5m
	Section A2-1 (PK3.5 - PK4.3)			
	Section A2-2 (PK4.3 - PK6.1)			
Projected Traffic Demand (2024)	Section A1 (BP - PK3.5)	28,000 ~ 42,000 pcu/day		
	Section A2-1 (PK3.5 - PK6.1)	28,000 ~ 33,000 pcu/day		
Number of affected permanent structures and residents.  (See Note 1)	Section A1 (BP - PK3.5)	Total: About 2, including - Residential structures : 0 (None)	Total: About 2 including - Residential structures : 0 (None)	Total: About 0, including - Residential structures : 0 (None)
	Section A2-1 (PK3.5 - PK4.3)	Total : About 41, including - Residential structures : 5 (15 - 429 residents)	Total : About 21, including - Residential structures : 2 (4 - 152 residents)	Total : About 3, including - Residential structures : 0 (None)
	Section A2-2 (PK4.3 - PK6.1)	Total : About 44, including - Residential structures : 6 (29 - 431 residents)	Total : About 24, including - Residential structures : 5 (19 - 335 residents)	Total : About 4, including - Residential structures : 2 (4 - 81 residents)
	Throughout Section A	Total : About 87, including - Residential structures: 11 (44 - 860 residents)	Total : About 47, including - Residential structures: 7 (23 - 487 residents)	Total : About 7, including - Residential structures: 2 (4 - 81 residents)
JICA Guideline Category (See Note 2)		A or B	A or B	B
Project Costs estimated by JST	Section A1 (BP - PK3.5)	US\$ 22.1 million	US\$ 21.4 million	US\$ 19.1 million
	Section A2-1 (PK3.5 - PK4.3)	US\$ 5.1 million	US\$ 4.8 million	US\$ 4.4 million
	Section A2-2 (PK4.3 - PK6.1)	US\$ 11.3 million	US\$ 10.9 million	US\$ 9.7 million
	Throughout Section A	US\$ 38.5 million (JPY 4.33 billion)	US\$ 37.1 million (JPY 4.18 billion)	<b>US\$ 33.2 million (JPY 3.73 billion)</b>
Cost borne by DRC  (See Note 3)	Underground Utility	US\$ 0.46 million	US\$ 0.46 million	US\$ 0.46 million
	Overhead Utility	US\$ 0.19 million	US\$ 0.19 million	US\$ 0.19 million
	Land Acquisition	US\$ 0.15 million	US\$ 0.07 million	US\$ 0.01 million
	Compensation	US\$ 0.38 million	US\$ 0.16 million	US\$ 0.02 million
	Resettlement	US\$ 0.24 million	US\$ 0.13 million	US\$ 0.02 million
	Throughout Section A	<b>US\$ 1.43 million (JPY 0.16 billion)</b>	<b>US\$ 1.01 million (JPY 0.11 billion)</b>	<b>US\$ 0.70 million (JPY 0.07 billion)</b>

Notes:

1. The figures in the parentheses indicate estimated number of affected residents. Assumed condition is that Low figures are "Area Sliced inside ROW boundary" and high figures are "Full Acquisition of Affected Structures"
2. Publication of EIA and RAP on JICA web-site and Review of JICA Expert Committee are mandatory.
3. Land Acquisition cost is calculated from area of building footprint

Source: The Study Team

**Table 3.2.3 Comparison of Combination Options of 4-lane and 2-lane Sections**

Option Number		Option 7: 31.5m+10.5m in width	Option 8: 24.0m+10.5m in width	Option 9: 17.0m+10.5m in width
Road Width	Section A1 (BP - PK3.5)	31.5m	24.0m	17.0m
	Section A2-1 (PK3.5 - PK4.3)	10.5m	Same as the left	Same as the left
	Section A2-2 (PK4.3 - PK6.1)			
Projected Traffic Demand (2024)	Section A1 (BP - PK3.5)	46,000 ~ 59,000 pcu/day		
	Section A2-1 (PK3.5 - PK6.1)	Around 34,000 pcu/day		
Number of affected permanent structures and residents.  (See Note 1)	Section A1 (BP - PK3.5)	Total: About 26, including - Residential structures : 0 (None)	Total: About 12, including - Residential structures : 0 (None)	Total: About 3, including - Residential structures : 0 (None)
	Section A2-1 (PK3.5 - PK4.3)	Total : About 3, including - Residential structures : 0 (None)	Same as the left	Same as the left
	Section A2-2 (PK4.3 - PK6.1)	Total : About 4, including - Residential structures : 2 (4 - 81 residents)	Same as the left	Same as the left
	Throughout Section A	Total : About 33, including - Residential structures: 2 (4 - 81 residents)	Total : About 19, including - Residential structures: 2 (4 - 81 residents)	Total : About 10, including - Residential structures: 2 (4 - 81 residents)
JICA Guideline Category (See Note 2)		B	B	B
Project Costs estimated by JST	Section A1 (BP - PK3.5)	US\$ 30 million	US\$ 25.5 million	US\$ 24.3 million
	Section A2-1 (PK3.5 - PK4.3)	US\$ 4.4 million	US\$ 4.4 million	US\$ 4.4 million
	Section A2-2 (PK4.3 - PK6.1)	US\$ 9.7 million	US\$ 9.7 million	US\$ 9.7 million
	Throughout Section A	<b>US\$ 44.1 million (JPY 4.95 billion)</b>	<b>US\$ 39.6 million (JPY 4.45 billion)</b>	<b>US\$ 38.4 million (JPY 4.31 billion)</b>
Cost borne by DRC  (See Note 3)	Underground Utility	US\$ 0.60 million	US\$ 0.60 million	US\$ 0.46 million
	Overhead Utility	US\$ 0.19 million	US\$ 0.19 million	US\$ 0.19 million
	Land Acquisition	US\$ 0.38 million	US\$ 0.17 million	US\$ 0.04 million
	Compensation	US\$ 0.62 million	US\$ 0.24 million	US\$ 0.04 million
	Resettlement	US\$ 0.09 million	US\$ 0.05 million	US\$ 0.03 million
	Throughout Section A	<b>US\$ 1.88 million (JPY 0.21 billion)</b>	<b>US\$ 1.24 million (JPY 0.15 billion)</b>	<b>US\$ 0.76 million (JPY 0.07 billion)</b>

Notes:

- The figures in the parentheses indicate estimated number of affected residents. Assumed condition is that Low figures are "Area Sliced inside ROW boundary" and high figures are "Full Acquisition of Affected Structures"
- Publication of EIA and RAP on JICA web-site and Review of JICA Expert Committee are mandatory.
- Land Acquisition cost is calculated from area of building footprint

Source: The Study Team

## CHAPTER 4 Road Design Policy

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### 4.1 Road Design Condition

#### 4.1.1 Project Outline

The Project aims to improve a 6.1km section of University Avenue that lies between the Sendwe IS (Sendwe Intersection) and the RP Ngaba (Rond-Point Ngaba / Ngaba Roundabout). The road plan exhibited in the Master Plan envisages the existing University Avenue upgrading to a 4-lane road to improve the present traffic and road conditions and further to cope with the future traffic demand. Therefore, the alternative road width, such as the 2-lane or the 4-lane, is examined from the engineering point of view. The Project is to improve the existing University Avenue, and as such, the alignment of the existing road will be basically maintained without any major alteration. The outline of basic design for the Project is shown in Table 4.1.1.

**Table 4.1.1 Outline of the Project**

Planned Item		Description/Specifications
Target Section		6.1 km (BP - PK6.1 km including RP Ngaba)
Replacement with suitable materials on planned carriage-way and shoulder		PK1.6 - PK5.5 km
Planned Road Width		Option No.1 - No.9 (W = 31.5 m - 10.5 m) Refer to Table 3.1.1
Major Box-culvert Work	PK3.96 km	3.5 m width x 2.0 m height
Auxiliary Road Structures		<ul style="list-style-type: none"> <li>▪ Kerbstone work</li> <li>▪ Road markings</li> <li>▪ Guard posts</li> <li>▪ Road signs</li> <li>▪ Traffic signal/ lightning</li> </ul>

Source: The Study Team

Figure 4.1.1 shows current situation of University Avenue and it was confirmed that the existing weak soil subgrade needs to be replaced based not only on the information from the Counterpart engineers but also on the topographic feature around the project area. Further, it is conceived that a water ponding emerges between PK1.6 km and PK5.5 km as indicated in the topographic map shown in Figure 4.1.2.



**Water ponding in the existing road at around PK2.0 km**



**Water ponding with debris in the existing road at around PK4.0 km**



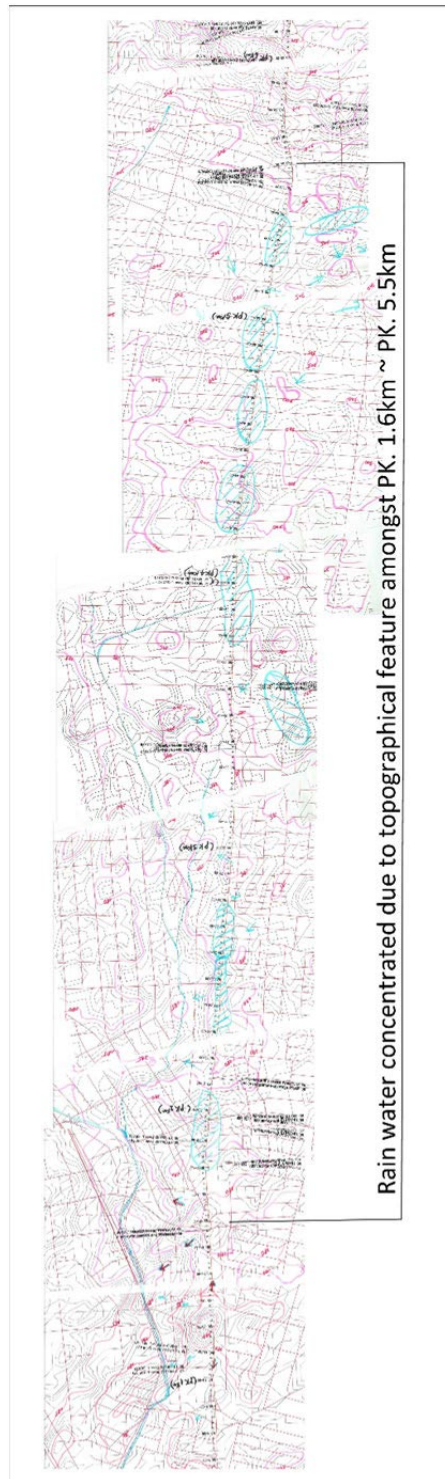
**Cracks due to high groundwater level around PK5.5 km**



**Destructed existing pavement due to high groundwater level**

Source: The Study Team

**Figure 4.1.1 Current Road Situation of University Avenue**



Note: Estimated water ponding areas are indicated in light blue.

Source: The Study Team

**Figure 4.1.2 Water ponding areas between PK1.6 km and PK5.5 km**

#### **4.1.2 Road Design Condition and Geometric Parameter**

The typical cross section was proposed referring to the design standard of AASHTO, that of Japan as well as that of DRC. In principle, the geometric parameters were adopted from “Explanations and Applications of the Operation and Commentary of the Japanese Road Structure Ordinance”.

The road design conditions applied for the Project are shown in Table 4.1.2.

**Table 4.1.2 Road Design Condition and Geometrical Parameter**

<b>Item</b>	<b>Unit</b>	<b>Design Constant</b>
Type of Road	-	Urban trunk road
Design Speed	km/h	60
Number of Lanes	Lane	2 ~ 4
Width of Lane	m	3.25 ~
Width of Shoulder	m	0.5~2.5
Width of Sidewalk	m	*1.5~4.0
Maximum Longitudinal Gradient	%	5 (6% within 500 m)
Minimum Radius of Curvature	m	150

Source: The Study Team

Note: \* Refer to the following explanation regarding 1.5m width of sidewalk.

According to the configuration of the road width shown in the Japanese standard, the maximum width of carriage-way is 3.25m for the urban trunk road, the width of shoulder is 0.5m and the width of median strip is 3.0m that could be used for the additional lane width for exclusive use of left-turning traffic at the intersection. The minimum width of the sidewalk is 2.0m in the Japanese standard in consideration of the use of a wheelchair and in view of barrier-free concept. Basically, the width of sidewalk is not determined by the traffic volume-based road classification, but according to the situation of the local area. At the time of the previous Japanese standard, the required width of a pedestrian was considered to be 0.75m, and thus the minimum sidewalk width was set to be 1.5 m. Considering the physique size of a Congolese, the sidewalk width of 2m is considered appropriate as the minimum. In the Congo-Japon Boulevard, the 2.0 m width sidewalk was adopted and it is observed to be functioning adequately.

In addition, the necessary space to relocate the existing underground utilities on both sides of the planned road should be considered.

## **4.2 Pavement**

### **4.2.1 Existing Traffic Loading**

In Pre F/S, the axle load survey was not requested and currently the existing traffic cannot run straight throughout the project road because of the destruction of existing major drainages crossing the road at around PK4.0 km. Therefore, the axle loading is inevitably based on the prevailing local condition. As shown in Figure 4.2.1, severe loading on the existing road surface was observed by the joint investigation with the DRC counterpart on 13 October 2018. Despite the low heavy axle load traffic, trucks seem to be delivering a large volume of cargo judging from the observed collapse of the tires.



**Semi-container delivering truck with 2 axles**



**Full scale of delivering white sand by truck with 3 axles**

Source: The Study Team

**Figure 4.2.1 Situation of Severe Loading**

#### 4.2.2 Pavement Structure

Regarding planning for the pavement structure of the project road, it is difficult to estimate the configuration of the structure without knowing the number of heavy vehicles on the road. However, it is considered that Congo-Japon Boulevard, which is one of the trunk roads in Kinshasa City, has been opened to traffic since 2012, and thus its pavement structure could be reliable because it does not show any major defects up to present. Hence, the pavement structure of the project road referred to Congo-Japon Boulevard for designing the pavement and estimating the pavement cost. The pavement structures are adopted as shown in Table 4.2.1.

**Table 4.2.1 The Pavement Structure**

Road Paving Work	Surface Course	Asphalt concrete 3cm (for carriageway) and DBST (for sidewalk)
	Binder Course	Asphalt concrete 4cm
	Base Course	25cm (granular aggregate)
	Sub-base course	30cm (granular aggregate)

Source: The Study Team

### 4.3 Drainage Structure

#### 4.3.1 Existing Drainage System

The road drainage facilities were planned based on the existing drainage system. The existing system, in principle, is composed of the side ditch along the paved road and the culvert across the road. However, some sections show destruction of ditches due to insufficient drainage slope and drainage buried by debris, though the existing side ditches are paved with concrete.



**Non-functional existing side ditch by the improper slope gradient at PK1.2 km RHS**



**Buried pit and ditch by debris at the drainage crossing at PK2.2 km LHS**



**Bridge over Yolo River Crossing at Lumumba Road located downstream from University Avenue observed on 14 Oct. 2018**



**Crossing bridge at Lumumba Boulevard observed on 14 Oct. 2018 which was not overflooded before (information by residents)**



**Existing culvert crossing with 3.5m width at around PK3.96 km**



**Downstream (3.0 m width and 1.0 m depth on average) between buildings at PK3.95 km**

Note : Prepared by JICA study team based on Joint Investigation with DRC counterpart on 13 Oct. 2018, if not specified.

Source: The Study Team

**Figure 4.3.1 Situation of Existing Drainage**

While maximum efforts are made to utilise the existing road drainage facilities, the sizes and the capacity of side drainage and crossing culverts should be reviewed. Although drainage design is



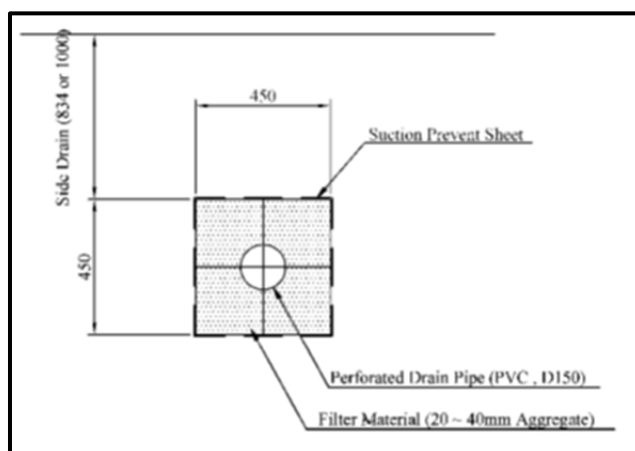
not required in the Study, a realistic cost estimate for planned drainage system is required for each option of the alternative typical cross sections.

Final destination of water flow toward the beginning point direction, i.e. Yolo River at Lumumba Boulevard, is located downstream from University Avenue. Some of the side drains have a certain adequate flow area. The fact that those existing side drains are made of concrete pavement with certain depth means there is a permanently sufficient water conveyance area. Hence, new side drains lined with concrete pavement along the entire route are planned with 0.8m wide and 1.0m - 2.0m deep and are functional in general as observed by the joint site investigation. Detail drainage calculation for the drainage system should be planned at detailed design stage.

The natural rainfall data which was obtained in three metrological stations in Kinshasa City for the design stage are attached in Appendix.

### 4.3.2 Subsoil Drain

Water ponding was observed between PK1.6 km and PK5.5 km (refer to Figure 4.1.2). The prompt collection and discharge of water from the inundated area is necessary due to the high underground water level. Therefore, the application of the subsoil drain pipe method is planned for the underground drainage. The permeable layer surrounding the drainage pipe consists of crushed stones of 20 - 40 mm in diameter. Suitable materials will be laid to prevent clogging of the pipe by fine grains. These pipes are connected to the catch basin or road crossing culvert for efficient discharge. The assumed quantity of the subsoil drain is estimated for the project cost.



Source: The Study Team

**Figure 4.3.2 Subsoil Drain Plan on Typical Cross Section**

The planned drainage for the cost estimation is shown in Table 4.3.1.

**Table 4.3.1 Requirements for the Drainage Items**

General Drainage System	<ul style="list-style-type: none"> <li>▪ Concrete paved side drain : 0.8m x 1.0m - 2.0m at the sections, etc.</li> <li>▪ Road crossing culvert and Connection Pits</li> </ul>
Underground Drainage	Subsoil drain between PK 1.6 km ~ PK. 5.5 km

Source: The Study Team

## 4.4 Outline of Road Planning

### 4.4.1 Control Points

The horizontal alignment of the project road inherits principally that of the existing road. Some alignment elements derived from the standards of the geometric structure of roads should be incorporated into the detailed design in order to minimize impacts on fencing and housing as well as topographical changes along the route. Especially the alignment of Section A2 (Yolo Ezo IS – RP Ngaba) cannot be changed drastically from the existing road because of a limit of space available in front of the existing buildings along the road. In Section A1 (Sedwe IS – Yolo Ezo IS), there is sufficient space to set up the alignment within the standard geometric parameter. However, to minimize the impact to the existing road, it is found appropriate to follow the existing road alignment but necessary to shift as required to avoid such facilities as gas-stations. Thus, only Section A1 will require, when setting the alignment, to consider control points as shown in Table 4.4.1.

**Table 4.4.1 Control Points on Section A1**

CP No.	Station (km)	Direction	Control Points
1	PK0.4	LHS	The alignment should be planned to minimize impacts on the existing building in the school premises.
2	PK0.9	Both Side	The centre of road should run between existing gas-stations.
3,4,5	PK0.6-0.8	Both Side	To avoid existing electric transfer building
6	PK1.4-1.45	LHS	To avoid fuel tank of existing gas-station.
7	PK1.5	RHS	To avoid fuel tank of existing gas-station.
8	PK1.56	LHS	To avoid crossing the beginning point of existing underground utility.
-	PK1.6-2.2	LHS	To reserve certain space for relocating the existing utilities on the left hand side of residential area.
9	PK2.35	RHS	To avoid fuel tank of existing gas-station.
10	PK2.4	RHS	To avoid fuel tank of existing gas-station.
11	PK3.07	LHS	To avoid fuel tank of existing gas-station.

Notes: 1. CP means “Control Point” that should be avoided when the alignment is planned.

2. LHS means left hand side toward the ending point (RP Ngaba) and RHS means the opposite side of LHS.

Source: The Study Team

### 4.4.2 Planned Road

Standard geometric parameters at a design speed of 60km/h are adopted to the extent possible by following the existing road alignment and minimizing impacts on roadside facilities. The beginning point is defined at the Sendwe IS and the ending point is defined at RP Ngaba. The parameters in detail are shown in Table 4.4.2

**Table 4.4.2 Adapted Horizontal Geometric Parameter**

Section	No	Station	Code	Parameter	Direction		
A	A1	0	PK 0 + 0.000	BP of A section	-	-	
		1	PK 0 + 417.950	BC1	R=1000 m	L_Curve	
		2	PK 0 + 726.470	EC1	R=1000 m	L_Curve	
		3	PK 0 + 972.907	BC2	R=2000 m	R_Curve	
		4	PK 1 + 223.497	EC2/BC3	R=2000 m / 1000 m	R/L_Curve	
		5	PK 1 + 463.157	EC3/BC4	R=1000 m / 1100 m	L/R_Curve	
	A2-1	6	PK 1 + 539.830	EC4/KA1	R=1100 m/ A=900	L_Curve	
		7	PK 2 + 276.194	KE1	A=900	L_Curve	
		8	PK 2 + 535.061	BC5	R=1600 m	R_Curve	
		9	PK 2 + 735.134	EC5/BC6	R=1600 m / 2000 m	R/L_Curve	
		10	PK 2 + 926.876	EC6	R=2000 m	L_Curve	
		11	PK 3 + 178.076	BC7	R=1300 m	L_Curve	
		12	PK 3 + 384.522	EC7/BC8	R=1300 m / 1300 m	L/R_Curve	
		13	PK 3 + 595.385	EC8	R=1300 m	R_Curve	
		14	PK 3 + 801.701	BC9	R=12000m	R_Curve	
		15	PK 3 + 928.393	EC9/BC10	R=12000m / 6000 m	R/R_Curve	
		16	PK 4 + 75.061	EC10	R=6000 m	R_Curve	
		A2-2	17	PK 5 + 71.720	BC11	R=4000 m	L_Curve
			18	PK 5 + 185.741	EC11/BC12	R=4000 m / 4000 m	L/R_Curve
	19		PK 5 + 299.762	EC12	R=4000 m	R_Curve	
	20		PK 5 + 460.449	KA2	A=140	L_Curve	
	21		PK 5 + 512.028	KA2/BC13	A=140 / 380 m	L_Curve	
	22		PK 5 + 621.072	EC13/KE3	R=380 m / A=140	L_Curve	
	23		PK 5 + 672.651	KA3/KA4	A=140 / 140	L/R_Curve	
	24		PK 5 + 724.230	KE4/BC14	A=140 / R=380 m	R_Curve	
	25		PK 5 + 788.110	EC14/KE5	R=380 m / A=140	R_Curve	
	26		PK 5 + 839.689	KA5	A=140	R_Curve	
	A2	27	PK 6 + 37.795	KA6	A=120	L_Curve	
		28	PK 6 + 89.224	KE6/BC15	A=120 / R=280 m	L_Curve	
29		PK 6 + 100.000	EP of A section	-	L_Curve		

Source: The Study Team

For the design of the longitudinal alignment of the project road, the elevation is necessary to be planned to ensure smooth level crossing with other roads at the existing intersections. The steepest longitudinal alignment is observed between PK5.5 km and PK6.1 km (RP Ngaba) in Section A. Such a steep slope, however, will not be a problem since the standard design value of the longitudinal gradient is 5% at a design speed of 60 km/h.

## **CHAPTER 5    Outline Project Cost**

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### **5.1    Procurement Situation and Preconditions of Cost Estimation**

#### **5.1.1    Labour Related Laws and Regulations**

##### **(1) Labour Situation**

Workers in the Democratic Republic of Congo (DRC) are protected by the Labour Code, but the regulation of many labour codes is yet undeveloped. Therefore, it is necessary for employers to take their own labour management individually.

Also, labour unions and employer associations have adopted a national labour agreement which concludes their own group agreement by industry, and it is applied for employment.

##### **(2) Labour Related Laws and Regulations**

###### **a) Labour related laws and regulations**

Employment of wage workers in DRC are based on the following laws and regulations and emphasis is placed on protection of workers' rights.

- Labour Code No. 015/2002 (October 16, 2002)
- Inter-occupational national labour agreement (May 2005)

###### **b) Employment form**

There are three forms of employment, that is, a day labourer, temporary employment and indefinite employment. However, if you are engaged in 22 days for 2 months on daily employment, it will be deemed as an indefinite term contract. In the case of temporary employment, it will be limited to a maximum of 2 years and the contract renewal will be only once. In case of indefinite employment, a trial period of 1 month or 6 months can be added depending on types of occupations.

With regard to dismissal, in accordance with the Labour Code, it must be notified 14 days to 3 months prior to the dismissal.

###### **c) Working hours**

According to the Labour Code, the working hours are 45 hours a week and 9 hours a day. Also, during a consecutive 7 days, it provides that 48 hours of off-work (5-day working / 2-day holiday) should be given.

###### **d) Holiday**

There is a paid leave system, which provides a one-day leave every month, but the right to acquire

the leave becomes effective after 12 months of work. In addition to the paid leave, congratulations and condolences holidays (marriage of oneself, birth of children, death of parents etc.) are given.

Regarding sick leave, 2/3rd of salary can be received during the sick leave period. Even in case of illness or injury due to work, 2/3rd of salary can also be received for a maximum of 6 months. The employer has to bear the burden of treatment cost as well.

### **(3) Salary**

The minimum wage is stipulated by the Labour Code. Wages include basic salaries, commissions, living allowances and other social benefits. Wage payment can be chosen by day, week, or monthly payment.

Allowances cover commuting allowances, housing or living allowances, medical service expenses for employees and their families and legal family allowances.

### **(4) Social security expenses**

Social security expenses are paid to *Institut National de Sécurité Sociale* (INSS / National Institute of Social Security) and *Institut National de la Préparation Professionnelle* (INPP / National Institute of Professional Preparation).

INSS is prepared for work-related injury risk, and 3.5% and 5.0% of the salary amount (including allowances) is borne by the worker and the employer respectively.

INPP is aimed at providing workers with vocational training and work improvement and thus promotes a quick fostering of new workers or new job takers. And the obligation for those costs is stipulated to be paid by the employer.

The burden of the employer's cost depends on the number of employees. And the burden amount is 1-3% of the remuneration amount to the employees.

## **5.1.2 Ability of the Local Subcontractor/Technical Capability/Personal Resource and Status of Ownership of Construction Machinery**

### **(1) Ability of the Subcontractor / Technical skills / Personal Resource**

In DRC, construction companies listed in Table 5.1.1 are receiving orders for road construction and renovation work from OVD and OR and water supply construction work from international organizations such as the World Bank, etc. Even in the present situation each construction is under way.

Each company owns a construction machine including a concrete plant. However, only CGCD, which is a Chinese enterprise owns an asphalt plant and other contractors purchase the product of asphalt concrete from CGCD.

Adi Construct has experience in participating as a subcontractor in the rehabilitation work of Congo-Japon Boulevard and the Vocational Training School Construction project by the Japanese grant aid.

**Table 5.1.1 Major Construction Contractors in DRC**

<b>Company Name</b>	<b>Address</b>	<b>Contact Number</b>	<b>Remark</b>
Safricas	01, Congo-Japon Boulevard C/Limete	Tel : (+243)8518089976 E mail : safricas@safricas.com	
EGMF	Avenue des Entrepots	Tel : (+243)841890507 (+243)998307872 (+243)814651979 (+243)841890569	
Safrimex	954, Metallurgie Avenue, Quartier Kingabwa, C/Limete	Tel : (+243)999922111 E mail : socimex@socimex.net	Middle Eastern company City road repair work in progress
CGCD	Cité Belle Vue, villa no 74, C/Ngaliemaa	Tel : (+243)851178014	Chinese company Own asphalt plant Proven track record of Bypass Avenue construction etc. World Bank Water Supply Project in progress
Zhengwey	29, Lubefu Avenue, C/Gombe	Tel : (+243)852500739 (+243)852500595 E mail : zhengwei_gg@yahoo.cn	
Power Master	8, Likasi Avenue, Quartier Batetela, C/Gombe	Tel : (+243)814444402 (+243)844448001 Assistant DG (Désiré BALOLAGE)	
Adi Construct	Congo-Japon Boulevard, Dans l'enceinte de l'Office des Routes, C/Limete	Tel : (+243)999403226 (+243)855251827 DG (Benoit ADIMASHI)	Participation experience in Japanese grant aid project Congo-Japon Boulevard maintenance operator (Contract with Infrastructure Unit)
Afritec	04, Congo-Japon Boulevard C/Limete	Tel : (+243)819824177	

Source: The Study Team

## **(2) Status of ownership of construction machinery**

Interview surveys to four companies out of the companies listed in Table 5.1.1 has been conducted. According to the results of these surveys, it is revealed that each company owns construction machines related to the road construction but not asphalt plants. Since there are no special construction projects such as bridge construction on this University Avenue Project, the major construction companies in DRC are deemed capable to implement the road improvement project.

## **5.1.3 Source of Procurement of Materials/Construction Machinery (Local, Japan, Third Country)**

### **(1) Procurement method**

Cement and reinforcement bar are produced in DRC, the aggregate and the crushed stone plant for the roadbed material are available near Kinshasa City and there is also sufficient production

volume.

Sand is also collected near Kinshasa City. Domestic procurement of DRC is possible for materials other than asphalt paving material (bituminous, emulsion, etc.).

Major materials manufacturers are shown in Table 5.1.2.

**Table 5.1.2 Major materials manufacturing companies in DRC**

Company Name	Address	Contact Number	Remark
<b>Cement</b>			
CILU	30 Juin Boulevard C/Gombe	Tel : (+243)817005794 (+243)817005793	
CIMKO	4, Port Avenue C/Gombe	Tel : (+243)999989544 (+243)820107268	
PPC	90A-990B Immeuble Paradiso 30 Juin Boulevard	E mail : service.client@ppcrdc.cd	
<b>Reinforcement Bar</b>			
LEDYA METAL	14°Rue Limete C/Limete		
Fabri Metal Congo (FAMECO)	17°Rue Limete C/Limete	Tel : (+243)999925982 E mail : info@fabrimetal.net	
<b>Crushed Stone</b>			
CARRIGRES TEXAF	5, Ecole Avenue, C/Ngaliema	Tel : (+243)815133005	

Source: The Study Team

In addition, the source of bituminous materials imported by CGCD (Chinese company) is Malaysia. Moreover, if temporary materials such as sheet piles are required, procurement in Japan or third countries is required.

Furthermore, timely procurement is required for ready-mixed concrete and asphalt concrete. Therefore, procurement of those plants should consider procuring from Japan or third countries in order to balance with other projects and to ensure the concrete quality.

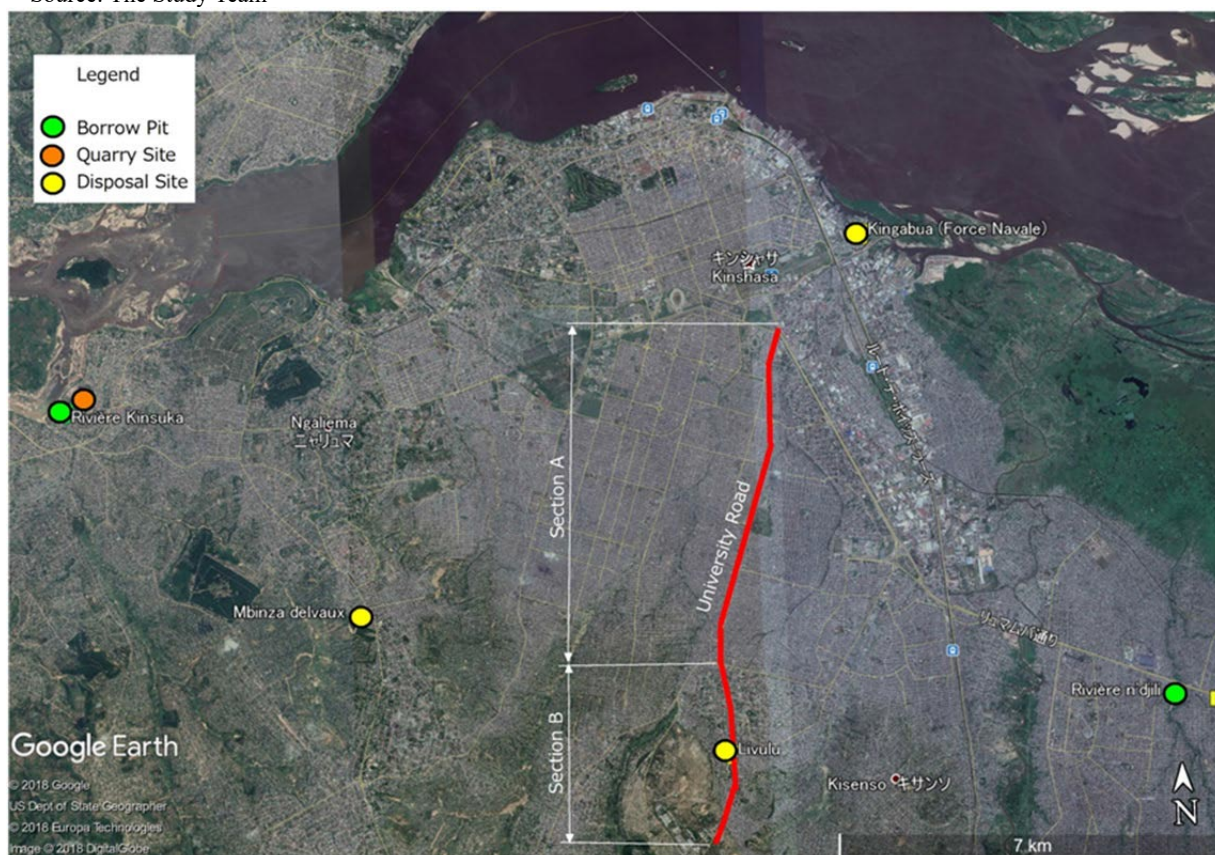
The supplier list of major materials is shown in Table 5.1.3.

The location of the quarry, borrow pit, and the construction waste disposal site are shown in Figure 5.1.1.

**Table 5.1.3 List of suppliers of major materials**

Name of Construction Material	Local Procurement	Japan Procurement	Third Country Procurement	Remark
Reinforcement bar ( $\Phi 6 \leq \Phi 25$ mm)	✓			
Temporary steel material		✓	✓	Sheet pile, H steel shall import
Temporary steel material	✓			General shaped steel can procure in DRC
Cement	✓			
Ready-mixed concrete	✓			
Admixture	✓			
Coarse aggregate, fine aggregate, sand	✓			
Roadbed material	✓			
Asphalt Concrete	✓			Chinese company
Bituminous material			✓	
Formwork	✓			

Source: The Study Team



Source: Google, Digital Globe taken on the 6th March, 2018, edited by the Study Team

**Figure 5.1.1 Location of Quarry, Borrow Pit and Construction Waste Disposal Site**



## **(2) Procurement price**

Basically, regarding the price of equipment and materials necessary for the project, the procurement price is the quoted price. VAT (16%) is taxed for payment by taxable entities in supplying goods and providing services. Labour wage and agricultural activities are not subject to taxation.

## **(3) Transportation cost**

Transportation expenses of materials and imported materials procured domestically in the country are included in the quoted price, so there is no need to estimate them separately. However, since the aggregate will be handed over at the quarry site, transportation cost should be added to the quoted price.

## **(4) Transport route**

Most of the non-hazardous materials and equipment are imported from outside the country through Kinshasa International Airport by aircraft.

The equipment procured by means of maritime transport will be unloaded at the port of Boma or the port of Matadi, the biggest port of DRC, downstream of the Congo River, and transported by land to Kinshasa. However, since Matadi Port is a river port, there are few vessels which directly come from overseas, and it is necessary to tranship cargoes at Pont Noir Port in the Republic of Congo.

### **5.1.4 Tax Exemption Procedure**

In grant aid projects in the DRC, taxes are exempted. The tax exemption procedure for each type of taxes is shown in Table 5.1.4.

**Table 5.1.4 Tax Exemption Procedure**

Type of tax	Tax rate	Related organization	Required related documents for tax exemption	Timing of document submission	Remarks
Corporate tax	10% of sales	Corporate Bureau Ministry of Finance	- Tax exemption Statement	Monthly	Attach E/N, etc.
Income tax	10% of basic salary	Tax Bureau Ministry of Finance	- Tax exemption statement	Monthly	Attach E/N, etc.
Value-added tax (VAT)	16% of basic salary	Finance Branch Ministry of Finance	- Tax exemption application - PL (Packing List) - BL (shipping document) - Invoice - IT / IC (tariff application form) - Letter from the Minister of Finance - Emergency transaction permit	Get in advance	It normally takes 6 months to process. Therefore, it is necessary to acquire an emergency transaction permit (about 1 month)
Customs duty	Calculated according to customs duty rate	Customs Bureau Ministry of Finance	- Emergency transaction application form - PL (Packing List) - BL (shipping document) - Invoice - IT / IC (tariff application form) - Proof of origin - FRI (import electronic information form)	Get in advance	Normally acquired in 0.5 months
Import inspection fee	4% of CIF price	Censorship Bureau (OCC)	- Application form for fee exemption of inspection - PL (Packing List) - BL (shipping document) - Invoice - Letter from the Commerce and Economy Minister to the OCC - Emergency pick-up permit - Letter from the Minister of Finance to the Minister of Commerce and Economy	Pre-exemption	It usually takes one month

Source: The Study Team

### 5.1.5 Time of Cost Estimation

Unit price survey was conducted from October 10 to October 27, 2018. Therefore, the time of cost estimation for this Pre F/S is defined as October, 2018.

#### (1) Exchange Rate

The currency unit of the DRC is Congo Franc (CDF), but US dollar (USD) also circulates widely and the deal of contracts is based on USD. Also, the currency unit of all the collected unit prices on this survey was in USD.

For this reason, the unit price data on locally procurable materials/equipment/services (so called local currency portion) are expressed in USD and the foreign currency portion which is required to procure those from Japan are expressed in Japanese Yen (JPY). In the cost estimation, the local currency is defined as USD and the foreign currency is defined as JPY.

The exchange rate will use the average rate of the past 3 months prior to September 2018.

The exchange rate from JPY to USD is estimated as shown in Table 5.1.5.

**Table 5.1.5 Exchange Rate Calculation Sheet Japanese Yen to US Dollar**

Month	July, 2018	August	September	Average rate calculation	
Accumulated average daily exchange rates (JPY)	2,360.07	2,577.89	2,032.39		
Business days (days)	21	23	18		
Average rate (JPY)	112.38	112.08	112.91	Total=	337.37
				Number of months =	3
				Average rate per 1 USD =	112.46

Source: Mitsubishi UFJ Bank

## (2) Price fluctuation

Calculation of the price fluctuation rate is based on the Congo Central Bank data and the forecast of inflation rate by IMF.

The results are shown as below:

### A) Scheduled month for bidding

January 2021 (2 years and 4 months from October 2018)

### B) Inflation rate

2018	23.0%	(forecasted by IMF for January-December, 2018)
2019	13.5%	(forecasted by IMF for January-December, 2019)
2020	6.20%	(forecasted by IMF for January-December, 2020)
2021	5.3%	(forecasted by IMF for January-December, 2021)

### C) Applied Inflation rate

Inflation rates are applied to local currency parts such as locally procured equipment and labour. For the foreign currency portion such as procurement from Japan, the inflation rate will not be applied.

Therefore, in this cost estimate applies to USD as defined as local currency.

The inflation rate up to the bidding time is estimated as follows:

$$1 \times (1.230 \times 1/12)^3 \times 1.135 \times 1.067 \times (1.053 \times 1/12) = 1.2809 \Rightarrow 28.09\%$$

### **(3) Setting of Unit Price**

Unit price is set based on quotations from the local companies (contractors, suppliers, etc.) and Japanese companies, the Japanese standard price (price book etc.), and JICA's cost estimation manual.

#### **5.1.6 Handling of the Tax**

As mentioned earlier in the Procurement, taxes such as VAT and customs duties for the Project are assumed to be exempted.

## 5.2 Outline Project Cost for Section A

The result of cost estimation for Section A is shown in Table 5.2.1. The detailed design and construction supervision fee is 15% of the construction cost, and the contingency is 5% of the project cost.

**Table 5.2.1 Outline Project Cost (Unit: million USD)**

(unit: million USD)

Option*		4-lane Option			2-lane Option			4-lane + 2-lane Option		
		1 (31.5m)	2 (24.0m)	3 (17.0m)	4 (15.0m)	5 (13.5m)	6 (10.5m)	7 (31.5m & 10.5m)	8 (24.0m & 10.5m)	9 (17.0m & 10.5m)
A1	Construction Cost	26.1	22.2	21.1	19.2	18.6	16.6	26.1	22.2	21.1
	D/D, C/S Cost	3.9	3.3	3.2	2.9	2.8	2.5	3.9	3.3	3.2
	Project Cost	30.0	25.5	24.3	22.1	21.4	19.1	30.0	25.5	24.3
	Contingency	1.5	1.3	1.2	1.1	1.1	1.0	1.5	1.3	1.2
	Total Cost	31.5	26.8	25.5	23.2	22.5	20.1	31.5	26.8	25.5
A2-1	Construction Cost	6.0	5.1	4.8	4.4	4.2	3.8	3.8	3.8	3.8
	D/D, C/S Cost	0.9	0.8	0.7	0.7	0.6	0.6	0.6	0.6	0.6
	Project Cost	6.9	5.9	5.5	5.1	4.8	4.4	4.4	4.4	4.4
	Contingency	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2
	Total Cost	7.2	6.2	5.8	5.4	5.0	4.6	4.6	4.6	4.6
A2-2	Construction Cost	13.4	11.4	10.8	9.8	9.5	8.4	8.4	8.4	8.4
	D/D, C/S Cost	2.0	1.7	1.6	1.5	1.4	1.3	1.3	1.3	1.3
	Project Cost	15.4	13.1	12.4	11.3	10.9	9.7	9.7	9.7	9.7
	Contingency	0.8	0.7	0.6	0.6	0.5	0.5	0.5	0.5	0.5
	Total Cost	16.2	13.8	13.0	11.9	11.4	10.2	10.2	10.2	10.2
A2-1 + A2-2	Construction Cost	19.4	16.5	15.6	14.2	13.7	12.2	12.2	12.2	12.2
	D/D, C/S Cost	2.9	2.5	2.3	2.2	2.0	1.9	1.9	1.9	1.9
	Project Cost	22.3	19.0	17.9	16.4	15.7	14.1	14.1	14.1	14.1
	Contingency	1.1	1.0	0.9	0.9	0.7	0.7	0.7	0.7	0.7
	Total Cost	23.4	20.0	18.8	17.3	16.4	14.8	14.8	14.8	14.8
A1 + A2	Construction Cost	45.5	38.7	36.7	33.4	32.3	28.8	38.3	34.4	33.3
	D/D, C/S Cost	6.8	5.8	5.5	5.1	4.8	4.4	5.8	5.2	5.1
	Project Cost	52.3	44.5	42.2	38.5	37.1	33.2	44.1	39.6	38.4
	Contingency	2.6	2.3	2.1	2.0	1.8	1.7	2.2	2.0	1.9
	Total Cost	54.9	46.8	44.3	40.5	38.9	34.9	46.3	41.6	40.3

\*Note: Refer to typical cross section of each option to Figure 3.1.1. & 3.1.2

Source: The Study Team

## 5.3 Operation and Maintenance Cost

Main operation and maintenance work for the section A and incidental facilities maintained in the Project consist of daily inspection, cleaning and repair as shown in Table 5.3.1 and the annual average road operation and maintenance cost is estimated about 82,721USD for Option 1 to 38,023USD for Option 6 (i.e., 9.3 - 4.3 million JPY) per year.

**Table 5.3.1 Main Operation and Maintenance Item and Cost**

Unit: USD

Form	Cycle	Maintenance Items	Specification	Unit	Unit Price	Quantity	Times	Operation & Maintenance Cost
<b>Option 1: 4-lane (W=31.5m), refer to Typical Cross Section Fig. 3.1.1</b>								
Routine	Every year	Base Course Repair	1.0% of the Total Pavement Area	m <sup>2</sup>	23.88	1,176	12	336,995
		Patching	1.0% of the Total Pavement Area	m <sup>2</sup>	15.98	1,176	12	225,510
		Cleaning of Drainage Structure	25% of Total Drainage Structure Length	m	3.00	3,050	12	109,800
		Sub-total (1)	(12 years' worth)					672,305
Periodic	Every 5 years	Base Course Repair	2.0% of the Total Pavement Area	m <sup>2</sup>	23.88	2,351	3	168,426
		Overlay	5.0% of the Total Pavement Area	m <sup>2</sup>	15.98	5,878	3	281,791
		Cleaning of Drainage Structure	5% of Total Drainage Structure Length	m	3.00	610	3	5,490
		Sub-total (2)	(3 times every 5 years, to be implemented on a daily basis)					455,707
		Total (1)+(2)	(12 years equivalent + 3 years to be implemented on a daily basis)					1,128,012
		Operation & Management Cost	10% of above					112,801
		Ground Total	(15 years' worth)					1,240,813
		Cost per Year						82,721
<b>Option 2: 4-lane (W=24.0m), refer to Typical Cross Section Fig. 3.1.1</b>								
Routine	Every year	Base Course Repair	1.0% of the Total Pavement Area	m <sup>2</sup>	23.88	923	12	264,495
		Patching	1.0% of the Total Pavement Area	m <sup>2</sup>	15.98	923	12	176,994
		Cleaning of Drainage Structure	25% of Total Drainage Structure Length	m	3.00	3,050	12	109,800
		Sub-total (1)	(12 years' worth)					551,289
Periodic	Every 5 years	Base Course Repair	2.0% of the Total Pavement Area	m <sup>2</sup>	23.88	1,859	3	133,179
		Overlay	5.0% of the Total Pavement Area	m <sup>2</sup>	15.98	4,648	3	222,825
		Cleaning of Drainage Structure	5% of Total Drainage Structure Length	m	3.00	610	3	5,490
		Sub-total (2)	(3 times every 5 years, to be implemented on a daily basis)					361,494
		Total (1)+(2)	(12 years equivalent + 3 years to be implemented on a daily basis)					912,783
		Operation & Management Cost	10% of above					91,278
		Ground Total	(15 years' worth)					1,004,061
		Cost per Year						66,937
<b>Option 3: 4-lane (W=17.0m), refer to Typical Cross Section Fig. 3.1.1</b>								
Routine	Every year	Base Course Repair	1.0% of the Total Pavement Area	m <sup>2</sup>	23.88	868	12	248,734
		Patching	1.0% of the Total Pavement Area	m <sup>2</sup>	15.98	868	12	166,448
		Cleaning of Drainage Structure	25% of Total Drainage Structure Length	m	3.00	3,050	12	109,800
		Sub-total (1)	(12 years' worth)					524,982
Periodic	Every 5 years	Base Course Repair	2.0% of the Total Pavement Area	m <sup>2</sup>	23.88	1,736	3	124,367
		Overlay	5.0% of the Total Pavement Area	m <sup>2</sup>	15.98	4,340	3	208,060
		Cleaning of Drainage Structure	5% of Total Drainage Structure Length	m	3.00	610	3	5,490
		Sub-total (2)	(3 times every 5 years, to be implemented on a daily basis)					337,917
		Total (1)+(2)	(12 years equivalent + 3 years to be implemented on a daily basis)					862,899
		Operation & Management Cost	10% of above					86,290
		Ground Total	(15 years' worth)					949,189
		Cost per Year						63,279

<b>Option 4: 2-lane (W=15.0m), refer to Typical Cross Section Fig. 3.1.2</b>								
Routine	Every year	Base Course Repair	1.0% of the Total Pavement Area	m2	23.88	684	12	196,007
		Patching	1.0% of the Total Pavement Area	m2	15.98	684	12	131,164
		Cleaning of Drainage Structure	25% of Total Drainage Structure Length	m	3.00	3,050	12	109,800
		Sub-total (1)	(12 years' worth)					436,971
Periodic	Every 5 years	Base Course Repair	2.0% of the Total Pavement Area	m2	23.88	1,367	3	97,932
		Overlay	5.0% of the Total Pavement Area	m2	15.98	3,418	3	163,859
		Cleaning of Drainage Structure	5% of Total Drainage Structure Length	m	3.00	610	3	5,490
		Sub-total (2)	(3 times every 5 years, to be implemented on a daily basis)					267,281
Total (1)+(2)			(12 years equivalent + 3 years to be implemented on a daily basis)				704,252	
Operation & Management Cost			10% of above				70,425	
Ground Total			(15 years' worth)				774,677	
Cost per Year							51,645	

<b>Option 5: 2-lane (W=13.5m), refer to Typical Cross Section Fig. 3.1.2</b>								
Routine	Every year	Base Course Repair	1.0% of the Total Pavement Area	m2	23.88	653	12	187,124
		Patching	1.0% of the Total Pavement Area	m2	15.98	653	12	125,219
		Cleaning of Drainage Structure	25% of Total Drainage Structure Length	m	3.00	3,050	12	109,800
		Sub-total (1)	(12 years' worth)					422,143
Periodic	Every 5 years	Base Course Repair	2.0% of the Total Pavement Area	m2	23.88	1,306	3	93,562
		Overlay	5.0% of the Total Pavement Area	m2	15.98	3,264	3	156,476
		Cleaning of Drainage Structure	5% of Total Drainage Structure Length	m	3.00	610	3	5,490
		Sub-total (2)	(3 times every 5 years, to be implemented on a daily basis)					255,528
Total (1)+(2)			(12 years equivalent + 3 years to be implemented on a daily basis)				677,671	
Operation & Management Cost			10% of above				67,767	
Ground Total			(15 years' worth)				745,438	
Cost per Year							49,696	

<b>Option 6: 2-lane (W=10.5m), refer to Typical Cross Section Fig. 3.1.2</b>								
Routine	Every year	Base Course Repair	1.0% of the Total Pavement Area	m2	23.88	468	12	134,110
		Patching	1.0% of the Total Pavement Area	m2	15.98	468	12	89,744
		Cleaning of Drainage Structure	25% of Total Drainage Structure Length	m	3.00	3,050	12	109,800
		Sub-total (1)	(12 years' worth)					333,654
Periodic	Every 5 years	Base Course Repair	2.0% of the Total Pavement Area	m2	23.88	937	3	67,127
		Overlay	5.0% of the Total Pavement Area	m2	15.98	2,341	3	112,228
		Cleaning of Drainage Structure	5% of Total Drainage Structure Length	m	3.00	610	3	5,490
		Sub-total (2)	(3 times every 5 years, to be implemented on a daily basis)					184,845
Total (1)+(2)			(12 years equivalent + 3 years to be implemented on a daily basis)				518,499	
Operation & Management Cost			10% of above				51,850	
Ground Total			(15 years' worth)				570,349	
Cost per Year							38,023	

<b>Option 7: 4-lane (W=31.5m) + 2-lane (W=10.5m), refer to Typical Cross Section Fig. 3.1.1 &amp; Fig. 3.1.2</b>								
Routine	Every year	Base Course Repair	1.0% of the Total Pavement Area	m2	23.88	864	12	247,588
		Patching	1.0% of the Total Pavement Area	m2	15.98	864	12	165,681
		Cleaning of Drainage Structure	25% of Total Drainage Structure Length	m	3.00	3,050	12	109,800
		Sub-total (1)	(12 years' worth)					523,069
Periodic	Every 5 years	Base Course Repair	2.0% of the Total Pavement Area	m2	23.88	1,728	3	123,794
		Overlay	5.0% of the Total Pavement Area	m2	15.98	4,320	3	207,101
		Cleaning of Drainage Structure	5% of Total Drainage Structure Length	m	3.00	610	3	5,490
		Sub-total (2)	(3 times every 5 years, to be implemented on a daily basis)					336,385
Total (1)+(2)			(12 years equivalent + 3 years to be implemented on a daily basis)				859,454	
Operation & Management Cost			10% of above				85,945	
Ground Total			(15 years' worth)				945,399	
Cost per Year							63,027	

<b>Option 8: 4-lane (W=24.0m) + 2-lane (W=10.5m), refer to Typical Cross Section Fig. 3.1.1 &amp; Fig. 3.1.2)</b>								
Routine	Every year	Base Course Repair	1.0% of the Total Pavement Area	m2	23.88	724	12	207,469
		Patching	1.0% of the Total Pavement Area	m2	15.98	724	12	138,834
		Cleaning of Drainage Structure	25% of Total Drainage Structure Length	m	3.00	3,050	12	109,800
		Sub-total (1)	(12 years' worth)					456,103
Periodic	Every 5 year	Base Course Repair	2.0% of the Total Pavement Area	m2	23.88	1,448	3	103,735
		Overlay	5.0% of the Total Pavement Area	m2	15.98	3,620	3	173,543
		Cleaning of Drainage Structure	5% of Total Drainage Structure Length	m	3.00	610	3	5,490
		Sub-total (2)	(3 times every 5 years, to be implemented on a daily basis)					282,768
Total (1)+(2)			(12 years equivalent + 3 years to be implemented on a daily basis)				738,871	
Operation & Management Cost			10% of above				73,887	
Ground Total			(15 years' worth)				812,758	
Cost per Year							54,184	

<b>Option 9: 4-lane (W=17.0m) + 2-lane (W=10.5m), refer to Typical Cross Section Fig. 3.1.1 &amp; Fig. 3.1.2)</b>								
Routine	Every year	Base Course Repair	1.0% of the Total Pavement Area	m2	23.88	692	12	198,300
		Patching	1.0% of the Total Pavement Area	m2	15.98	692	12	132,698
		Cleaning of Drainage Structure	25% of Total Drainage Structure Length	m	3.00	3,050	12	109,800
		Sub-total (1)	(12 years' worth)					440,798
Periodic	Every 5 year	Base Course Repair	2.0% of the Total Pavement Area	m2	23.88	1,384	3	99,150
		Overlay	5.0% of the Total Pavement Area	m2	15.98	3,460	3	165,872
		Cleaning of Drainage Structure	5% of Total Drainage Structure Length	m	3.00	610	3	5,490
		Sub-total (2)	(3 times every 5 years, to be implemented on a daily basis)					270,512
Total (1)+(2)			(12 years equivalent + 3 years to be implemented on a daily basis)				711,310	
Operation & Management Cost			10% of above				70,873	
Ground Total			(15 years' worth)				779,599	
Cost per Year							51,973	

Source: The Study Team



## **CHAPTER 6    Outline of Project Cost by DRC Government**

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### **6.1    Existing Utility Conditions**

#### **6.1.1    Introduction**

The general scope of work undertaken by the DRC Government as general items of the Japanese Grant Aid Scheme is as follows:

- 1) Relocate buildings and their exteriors at the Project sites and trees along the planned route.
- 2) Remove and relocate existing public utilities (power lines, water lines, etc.) including underground structures from the Project sites.
- 3) Secure traffic control at necessary points.
- 4) Arrange tariff exemptions for equipment, materials and vehicles to be procured for the Project.
- 5) Secure and clear the site(s) required to set up temporary yard(s).
- 6) Secure a waste disposal site(s).
- 7) Provide conveniences for securing borrow pits and a rock quarry.

In Section 6.1, the locations and the quantity of existing public utilities, which will be affected by the road implementation stage for each option, were clarified on the road reserve area.

#### **6.1.2    Underground Utility**

Underground water supply pipe is maintained by REGIDESO (*Regie de Distribution d'Eau / Waterworks Bureau*) with their own GIS mapping system. When the Study Team carried out a joint inspection with them, it was confirmed that the location map was almost reliable regarding the existing pipes. However, underground electric cable which is maintained by SNEL (*Société Nationale d'Electricité / National Electricity Society*) is not likely to be well managed, because the location map was not properly updated in whole sections like the one owned by REGIDESO. Thus it was required to practice a field observation survey by a step by step joint inspection with SNEL's inspectors from the beginning point up to the ending point to confirm the existing location and the numbers of utilities.



**Valve Appeared on RHS at PK0.12 km on 16 November 2018**



**6.6KV SNEL cable Appeared on RHS at PK0.44 km on 16 November 2018**



**FD500mm and AC100mm Appeared on RHS at PK0.65 km on 16 November 2018**



**Crossing AG100mm on RHS at PK0.65 km on 16 November 2018**

Source: The Study Team

### **Figure 6.1.1 Current Situation of Underground Utility**

The quantity of each underground utility is shown in Table 6.1.1. However, it is necessary to confirm exact locations with proper trial pits in the detailed design stage before implementation.

**Table 6.1.1 Quantity of Underground Utilities on LHS and RHS necessary to relocate**

Table-1 Quantity of Underground Existing Utilities

Section	No.	Station No.	LHS (m)						RHS (m)											
			Water pipes				Electric Cable		Water pipes				Electric Cable							
			100AC	150AC	450PEHD	350AC	20KV	6.6KV	500 FD	110PVC	250AC	350AC	20KV	6.6KV						
A	A1	1	BP – PK0.65					1300	190					650	650			650	60	
		2	PK0.65 – PK0.80					450										200		
		3	PK0.80 – PK1.3					500										500		
		4	PK1.30 – PK3.10															1800		
		5	PK3.10 – PK3.35					260										780		
		6	PK3.35 – PK3.5					150												
	A2	A2-1	7	PK3.5 – PK3.62		120			120											
			8	PK3.62 – PK3.72		100														
			9	PK3.72 – PK3.93		210														
			10	PK3.93 – PK4.35		420														
Sub total 1 (A1 + A2-1)			0	850	0	0	2780	190			650	650	50	0	4010	60				
A	A2	A2-2	11	PK4.35 – PK5.82		1470														
			12	PK4.47 Crossing					30											
			13	PK4.75 Crossing					30											
			14	PK5.67 Crossing					30											
			15	PK6.30 Crossing			50													
Sub total 2 (A1 + A2)			0	2320	50	0	2870	190			650	700	50	50	4160	60				

Note:

1. Water pipe and electric underground cable are under the management of REGIDESO and SNEL, respectively.
2. Some sections described above imply multiple cable lines, so that the quantity will be double or triple in terms of the total length. Details should be confirmed on the drawing.
3. Quantity of cables by SNEL includes approximate 2,250m of "out of order" cable.
4. LHS means the left hand side towards the ending point of the project. RHS means the opposite of LHS.
5. Abbreviations of utilities are FD = *Fonte ductile* (ductile iron), PVC = *Polychlorure de vignyl* (Polyvinyle Chloride), AC = *Acier* (Steel), PEHD = *Poly éthylène haute densité* (High density polyethylene), AG = *Acier galvanisé* (Galvanized steel).

Source: The Study Team

### 6.1.3 Overhead Utility

Overhead utilities on the project site are only the electric supply and telecommunication facilities. Telecommunication facilities which are composed of optical fibre cable with poles are maintained by Standard Telecom. The electric cable on air is maintained by SNEL but some sections in charge of SNEL do not have cables but poles only. The quantity of each existing overhead utility is shown in Table 6.1.2. However, it will be necessary to confirm exact locations in the detailed design stage when final alignment would be determined.

**Table 6.1.2 Quantity of Overhead Utilities on LHS and RHS necessary to relocate**

Section	No.	Station No.		LHS							Standard TELECOM (m)	Section	No.	Station No.		RHS							Standard TELECOM (m)							
				SNEL (m)												SNEL (m)														
				Starting	Ending	1.6KV	6.6KV	Poles only	Crossing 1.6KV	Crossing 6.6KV						Optical fiber	Starting	Ending	1.6KV	6.6KV	Poles only	Crossing 1.6KV		Crossing 6.6KV	Optical fiber					
A	A1	1	PK 0 + 200	PK 0 + 500	300								A1	1	PK 0 + 900	PK 0 + 700	200													
		2	PK 0 + 920	PK 1 + 400		480									2	PK 0 + 900	PK 1 + 620		720											
		3	PK 1 + 660	PK 1 + 700											3	PK 0 + 900	PK 0 + 920								20					
		4	PK 2 + 0							50					4	PK 1 + 620	PK 1 + 660													
		5	PK 2 + 200	PK 2 + 500	300										5	PK 1 + 660	PK 1 + 700											40		
		6	PK 2 + 500							50					6	PK 2 + 0														
	A2	A2-1	7	PK 4 + 50	PK 4 + 100	50								7	PK 3 + 200	PK 3 + 500														
			8	PK 4 + 150	PK 4 + 200	50									8	PK 4 + 50	PK 4 + 100	50												
			9	PK 4 + 250							50				9	PK 4 + 200	PK 4 + 350	150												
			10	PK 4 + 250	PK 4 + 260	10									10	PK 4 + 250	PK 4 + 350	100												
			11	PK 4 + 250	PK 4 + 350	100									11	PK 4 + 250	PK 4 + 260	10												
Sub total 1 (A1 + A2-1)					810	480	0	150	0	40		Sub total 1 (A1 + A2-1)					510	870	360	0	50	40								
A	A2	A2-2	12	PK 5 + 300					50				A	A2	A2-2	12	PK 4 + 250	PK 4 + 400		150										
			13	PK 5 + 400	PK 5 + 600	200																								
			14	PK 5 + 800	PK 6 + 100																									
Sub total 2 (A1 + A2)					810	680	0	200	0	340		Sub total 2 (A1 + A2)					810	870	360	0	50	80								

Source: The Study Team

## 6.2 Land Acquisition, Resettlement, and Relocation

### 6.2.1 Compensation

#### (1) Compensation for Land

The information of public land or official ROW of University Avenue was not provided to the Study Team. Therefore, the extent of public land usable without land acquisition is not clear yet.

According to the traffic volume projected for the target year of 2030, proposed alternative plans of ROW of University Avenue were drawn on satellite imagery taken in 2018. Study of the satellite imagery and field observations revealed that many private buildings are already located within the future planned ROW and therefore, land acquisition will be necessary assuming that the land under those buildings are registered by private owners. Since information of public land and ROW boundaries was not provided by the DRC Government to the Study Team, the land area which is physically occupied or enclosed was regarded as private property. The land area which is not occupied or enclosed was regarded as public property and thus, it is not targeted for land acquisition.

Land acquisition for public works will be implemented based on Articles 193 to 203 of the Law No. 73-021 of 20 July 1973 Land Law (determining general regime of property, property and real estate regime and surety regime as amended and completed by Law no. 80-008 of 18 July 1980) (*Loi no. 73-021 du 20 juillet 1973 portant regime general des biens, regime foncier et immobilier et regime des suretes telle que modifiee et completee par la Loi no. 80-008 du 18 juillet 1980*), and Law 77-001 of 22 February 1977 on expropriation for reasons of public utility (*LOI 77-001 du 22 février 1977 sur l'expropriation pour cause d'utilité publique*).

Land area necessary to be acquired is shown in Table 6.2.1. The average unit price of land is estimated as 200 USD/m<sup>2</sup> based on the market price survey conducted in August 2018.

**Table 6.2.1 Land Area Necessary to be Acquired (m2)**

Section	Km	Type of Acquisition	Option No.					
			1	2	3	4	5	6
			Road Width					
			31.5m	24.0m	17.0m	15.0m	13.5m	10.5m
Section A1 (Sendwe IS – Yolo-Ezo IS)	BP -	Partial acquisition of land affected directly (Sliced land)	1,850.72	805.17	175.37	99.75	53.88	8.36
	PK 3.5	Full acquisition of affected land	1,850.72	805.17	175.37	99.75	53.88	8.36
Section A2-1 (Yolo-Ezo IS – Kianza Avenue)	PK 3.5 -	Partial acquisition of land affected directly (Sliced land)	7,558.16	3,398.26	727.00	288.64	129.50	5.56
	PK 4.3	Full acquisition of affected land	16,005.28	14,112.40	7,963.93	5,643.24	2,539.80	270.77
Section A2-2 (Kianza Avenue – RP Ngaba)	PK 4.3 -	Partial acquisition of land affected directly (Sliced land)	17,566.79	6,455.16	1,008.13	366.02	141.32	29.84
	PK 6.1	Full acquisition of affected land	34,735.00	28,914.32	16,841.46	8,865.55	3,159.81	694.47
Section A2 Subtotal (Yolo-Ezo IS – RP Ngaba)	PK 3.5 -	Partial acquisition of land affected directly (Sliced land)	25,124.94	9,853.42	1,735.13	654.66	270.82	35.40
	PK 6.1	Full acquisition of affected land	50,740.28	43,026.72	24,805.38	14,508.79	5,699.61	965.24
Total of Section A (Sendwe IS – RP Ngaba)	BP -	Partial acquisition of land affected directly (Sliced land)	26,975.66	10,658.59	1,910.50	754.41	324.70	43.76
	PK 6.1	Full acquisition of affected land	52,591.00	43,831.89	24,980.75	14,608.54	5,753.49	973.60

Source: The Study Team

## (2) Compensation for Structures

As described above, existing roadside structures will be affected by the improvement (widening) of University Avenue. Most of the roadside structures are used for commercial activities and when a structure has more than two stories, above floors are usually used for residential purposes. In addition, structures such as hospitals, churches, schools and universities are also located along University Avenue.

The structures affected by the Project are to be assessed, based on Inter-ministerial Order that fixes the rates of duties and taxes to be collected at the initiative of Ministry of Urbanism and Habitat (*Arrete interministeriel n° 022/cab/min.urbhab/ cj/ap/bnm/2011 et n°096/cab/min/finances/2011 du 29 mars 2012 modifiant l'arrete n°020/cab/min.urb-hab/ ay/2009 et 255/cab/min/finances/2009 portant fixation des taux des droits et taxes a percevoir a l'initiative du ministere de l'urbanisme et habitat*).

The number of structures affected by the project is counted and footprints of those structures are measured with reference to the satellite imaginary and summarized for each option of the project

plan as shown in Table 6.2.2 and Table 6.2.4. The average unit prices for structures are estimated as 500 USD/footprint m<sup>2</sup> for structures with ground floor alone, and 850 USD/footprint m<sup>2</sup> for structures with more than two floors, based on studying the resettlement plans for WB-assisted PURUS (2009) (*Programme d'Urgence de Rehabilitation Urbaine et Sociale*) and Congo-Japon Boulevard (2010) projects.

**Table 6.2.2 Structures and Area to be Affected (footprint m<sup>2</sup>) – Area Sliced inside ROW boundary**

Section	Building Level	Option No.											
		1		2		3		4		5		6	
		Road Width											
		31.5m		24.0m		17.0m		15.0m		13.5m		10.5m	
No	m2	No	m2	No	m2	No	m2	No	m2	No	m2		
Section A1 (Sendwe IS - Yolo-Ezo IS)	G	24	1,098.69	10	408.92	3	42.94	2	18.97	2	4.28	-	-
	G+1 and over	2	58.60	2	10.71	-	-	-	-	-	-	-	-
Section A2-1 (Yolo-Ezo IS - Kianza Avenue)	G	120	5,735.44	92	2,556.18	45	595.46	36	249.08	19	118.09	3	5.56
	G+1 and over	16	1,822.72	15	842.08	8	131.54	5	39.56	2	11.41	-	-
Section A2-2 (Kianza Avenue - RP Ngaba)	G	223	15,708.22	163	5,852.77	100	870.81	38	283.82	19	87.85	2	20.38
	G+1 and over	17	1,858.57	16	602.40	9	137.32	6	82.20	5	53.47	2	9.46
Section A2 Subtotal (Yolo-Ezo IS - RP Ngaba)	G	343	21,443.66	255	8,408.94	145	1,466.27	74	532.90	38	205.94	5	25.94
	G+1 and over	33	3,681.29	31	1,444.48	17	268.86	11	121.76	7	64.88	2	9.46
Total of Section A (Sendwe IS - RP Ngaba)	G	367	22,542.35	265	8,817.86	148	1,509.21	76	551.87	40	210.22	5	25.94
	G+1 and over	35	3,739.89	33	1,455.19	17	268.86	11	121.76	7	64.88	2	9.46
	Grand total	402	26,282.24	298	10,273.05	165	1,778.07	87	673.63	47	275.10	7	35.40

Note: "G" means ground (single) floor only, "G+1 and over" means multi-storied structure.

Source: The Study Team

**Table 6.2.3 Structures and Area to be Affected (footprint m2) - Full Acquisition of Affected Structures**

Section	Building Level	Option No.											
		1		2		3		4		5		6	
		Road Width											
		31.5m		24.0m		17.0m		15.0m		13.5m		10.5m	
		No	m2	No	m2	No	m2	No	m2	No	m2	No	m2
Section A1 (Sendwe IS - Yolo-Ezo IS)	G	24	4,130.38	10	2,415.80	3	1,176.16	2	226.20	2	226.20	-	-
	G+1 and over	2	1,020.20	2	1,020.20	-	-	-	-	-	-	-	-
Section A2-1 (Yolo-Ezo IS - Kianza Avenue)	G	120	12,003.74	92	10,110.86	45	5,487.88	36	4,097.71	19	1,878.09	3	270.77
	G+1 and over	16	4,001.54	15	4,001.54	8	2,476.05	5	1,545.53	2	661.71	-	-
Section A2-2 (Kianza Avenue - RP Ngaba)	G	223	30,999.69	163	26,127.56	100	15,486.92	38	7,890.02	19	2,520.12	2	341.26
	G+1 and over	17	3,735.31	16	2,786.76	9	1,354.54	6	975.53	5	639.69	2	353.21
Section A2 Subtotal (Yolo-Ezo IS - RP Ngaba)	G	343	43,003.43	255	36,238.42	145	20,974.80	74	11,987.73	38	4,398.21	5	612.03
	G+1 and over	33	7,736.85	31	6,788.30	17	3,830.59	11	2,521.06	7	1,301.40	2	353.21
Total of Section A (Sendwe IS - RP Ngaba)	G	367	47,133.81	265	38,654.22	148	22,150.96	76	12,213.94	40	4,624.42	5	612.03
	G+1 and over	35	8,757.05	33	7,808.50	17	3,830.59	11	2,521.06	7	1,301.40	2	353.21
	Grand total	402	55,890.86	298	46,462.72	165	25,981.55	87	14,735.00	47	5,925.82	7	965.24

Note: "G" means ground (single) floor only, "G+1 and over" means multi-storied structure.

Source: The Study Team

### (3) Compensation for Trees and Crops

Ownership of trees along the avenue is not yet clarified. Compensation for public trees and private trees need to be further studied in the next phase of the Project.

At some places, agriculture activities such as vegetables and fruit trees are observed. Owners and types of crops must be studied and recorded for compensation.

## 6.2.2 Assistances

### (1) Assistances for Relocating Businesses and Households

Those who need to relocate because of the Project will be provided cash assistance to cover the cost of the relocation as well as the average rent in short term (three months).

A census survey on the number of businesses and residential households to be relocated should be carried out in the next phase of the Project.

In the Pre F/S, the number of businesses and residential households (HH) are estimated during field observations. The estimation is shown in Table 6.2.4, Table 6.2.5, and Table 6.2.6. The number of affected persons can be estimated by multiplying the number of households by 5.5 persons which is the average number of household members obtained in the Study.

The amount of cash assistance is estimated as 900 USD/Business or HH, including 600 USD for the cost of relocation and 100 USD rent for 3 months, based on studying the resettlement plan for PURUS (2009).

**Table 6.2.4 Estimated Number of Businesses to Relocate**

Section	Km	Option No.					
		1	2	3	4	5	6
		Road width					
		31.5m	24.0m	17.0m	15.0m	13.5m	10.5m
Section A1 (Sendwe IS - Yolo-Ezo IS)	BP - PK3.5	78	36	9	6	6	0
Section A2-1 (Yolo-Ezo IS - Kianza Avenue)	PK3.5 - PK4.3	408	321	159	123	63	9
Section A2-2 (Kianza Avenue - RP Ngaba)	PK4.3 - PK6.1	720	537	327	132	72	12
Section A2 Subtotal (Yolo-Ezo IS - RP Ngaba)	PK3.5 - PK6.1	1,128	858	486	255	135	21
Total of Section A (Sendwe IS - RP Ngaba)	BP - PK6.1	1,206	894	495	261	141	21

Source: The Study Team



**Table 6.2.5 Estimated Number of Households to Relocate - Area Sliced inside ROW Boundary**

Section	Km	Option No.					
		1	2	3	4	5	6
		Road width					
		31.5m	24.0m	17.0m	15.0m	13.5m	10.5m
Section A1 (Sendwe IS - Yolo-Ezo IS)	BP - PK3.5	0	0	0	0	0	0
Section A2-1 (Yolo-Ezo IS - Kianza Avenue)	PK3.5 - PK4.3	101	46	8	3	1	0
Section A2-2 (Kianza Avenue - RP Ngaba)	PK4.3 - PK6.1	87	33	9	6	4	1
Section A2 Subtotal (Yolo-Ezo IS - RP Ngaba)	PK3.5 - PK6.1	188	79	17	9	5	1
Total of Section A (Sendwe IS - RP Ngaba)	BP - K6.1	188	79	17	9	5	1

Source: The Study Team

**Table 6.2.6 Estimated Number of Households to Relocate - Full acquisition of Affected Structures**

Section	Km	Option No.					
		1	2	3	4	5	6
		Road width					
		31.5m	24.0m	17.0m	15.0m	13.5m	10.5m
Section A1 (Sendwe IS - Yolo-Ezo IS)	BP - PK3.5	0	0	0	0	0	0
Section A2-1 (Yolo-Ezo IS - Kianza Avenue)	PK3.5 - PK4.3	229	225	125	78	28	0
Section A2-2 (Kianza Avenue - RP Ngaba)	PK4.3 - PK6.1	157	152	103	79	61	15
Section A2 Subtotal (Yolo-Ezo IS - RP Ngaba)	PK3.5 - PK6.1	386	377	228	157	89	15
Total of Section A (Sendwe IS - RP Ngaba)	BP - PK6.1	386	377	228	157	89	15

Source: The Study Team

## (2) Assistancess for Vulnerable Groups

Among the relocations, those who belong to vulnerable groups such as households with women as the head of household, and elderly households without family support need to be identified and proper additional assistance should be so that the relocation does not negatively affect their living standard.

The types and number of vulnerable targets and practical and effective assistance measures need to be determined in the next phase of the Project.

## 6.3 Project Cost Borne by DRC Government

According to the condition of the Japanese Grant Aid project, the relocating cost of necessary land and underground utility such as water supply and electricity which might be obstacles will be

borne by the recipient country.

Table 6.3.1 and Table 6.3.2 shows the quantities of occupants and unit cost for relocation shows the quantities of compensation and compensation unit cost accordingly. The approximate occupancy relocation expenses and compensation expenses to be borne by DRC are shown in Table 6.3.3.

**Table 6.3.1 Relocation Quantity of Occupiers and Unit Price for Section A**

Occupiers	Standard	Unit Price (USD)	4-lane Option			2-lane Option			4-lane + 2-lane Option		
			1 (31.5m)	2 (24.0m)	3 (17.0m)	4 (15.0m)	5 (13.5m)	6 (10.5m)	7 (31.5m & 10.5m)	8 (24.0m & 10.5m)	9 (17.0m & 10.5m)
<b>Section A1</b>											
Water pipe	Ductile cast iron pipe, 500mm	209.00	650	650	0	0	0	0	650	650	0
	PVC, 110mm	14.00	650	650	0	0	0	0	650	650	0
	Iron pipe, 350mm	180.00	0	0	0	0	0	0	0	0	0
	Iron pipe, 250mm	134.00	50	50	50	50	50	50	50	50	50
	Iron pipe, 150mm	64.00	0	0	0	0	0	0	0	0	0
	Iron pipe, 100mm	29.00	0	0	0	0	0	0	0	0	0
	High density polyethylene pipe, 450mm	229.00	0	0	0	0	0	0	0	0	0
	Galvanized pipe	0.00	0	0	0	0	0	0	0	0	0
Underground electric wire	20KV	40.00	6,590	6,590	6,590	6,590	6,590	6,590	6,590	6,590	6,590
	6.6KV	55.00	250	250	250	250	250	250	250	250	250
Electric wire	6.6KV, Electrical pole included, electric pole interval 50 m	34.00	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200
	1.6KV, Electrical pole included, electric pole interval 50 m	48.00	800	800	800	800	800	800	800	800	800
Transverse electric wire	6.6KV, Electrical pole included, electric pole interval 50 m	34.00	50	50	50	50	50	50	50	50	50
	1.6KV, Electrical pole included, electric pole interval 50 m	48.00	100	100	100	100	100	100	100	100	100
	Electric pole only	20.00	360	360	360	360	360	360	360	360	360
Optical cable	Electrical pole included, electric pole interval 50 m	30.00	80	80	80	80	80	80	80	80	80
<b>Section A2-1</b>											
Water pipe	Ductile cast iron pipe, 500mm	209.00	0	0	0	0	0	0	0	0	0
	PVC, 110mm	14.00	0	0	0	0	0	0	0	0	0
	Iron pipe, 350mm	180.00	0	0	0	0	0	0	0	0	0
	Iron pipe, 250mm	134.00	0	0	0	0	0	0	0	0	0
	Iron pipe, 150mm	64.00	850	850	850	850	850	850	850	850	850
	Iron pipe, 100mm	29.00	0	0	0	0	0	0	0	0	0
	High density polyethylene pipe, 450mm	229.00	0	0	0	0	0	0	0	0	0
	Galvanized pipe	0.00	0	0	0	0	0	0	0	0	0

Occupiers	Standard	Unit Price (USD)	4-lane Option			2-lane Option			4-lane + 2-lane Option		
			1 (31.5m)	2 (24.0m)	3 (17.0m)	4 (15.0m)	5 (13.5m)	6 (10.5m)	7 (31.5m & 10.5m)	8 (24.0m & 10.5m)	9 (17.0m & 10.5m)
Underground electric wire	20KV	40.00	200	200	200	200	200	200	200	200	200
	6.6KV	55.00	0	0	0	0	0	0	0	0	0
Electric wire	6.6KV, Electrical pole included, electric pole interval 50 m	34.00	150	150	150	150	150	150	150	150	150
	1.6KV, Electrical pole included, electric pole interval 50 m	48.00	520	520	520	520	520	520	520	520	520
Transverse electric wire	6.6KV, Electrical pole included, electric pole interval 50 m	34.00	0	0	0	0	0	0	0	0	0
	1.6KV, Electrical pole included, electric pole interval 50 m	48.00	50	50	50	50	50	50	50	50	50
	Electric pole only	20.00	0	0	0	0	0	0	0	0	0
Optical cable	Electrical pole included, electric pole interval 50 m	30.00	0	0	0	0	0	0	0	0	0
<b>Section A2-2</b>											
Water pipe	Ductile cast iron pipe, 500mm	209.00	0	0	0	0	0	0	0	0	0
	PVC, 110mm	14.00	50	50	50	50	50	50	50	50	50
	Iron pipe, 350mm	180.00	50	50	50	50	50	50	50	50	50
	Iron pipe, 250mm	134.00	0	0	0	0	0	0	0	0	0
	Iron pipe, 150mm	64.00	1,470	1,470	1,470	1,470	1,470	1,470	1,470	1,470	1,470
	Iron pipe, 100mm	29.00	0	0	0	0	0	0	0	0	0
	High density polyethylene pipe, 450mm	229.00	0	0	0	0	0	0	0	0	0
	Galvanized pipe	0.00	50	50	50	50	50	50	50	50	50
Underground electric wire	20KV	40.00	240	240	240	240	240	240	240	240	240
	6.6KV	55.00	0	0	0	0	0	0	0	0	0
Electric wire	6.6KV, Electrical pole included, electric pole interval 50 m	34.00	200	200	200	200	200	200	200	200	200
	1.6KV, Electrical pole included, electric pole interval 50 m	48.00	400	400	400	400	400	400	400	400	400
Transverse electric wire	6.6KV, Electrical pole included, electric pole interval 50 m	34.00	50	50	50	50	50	50	50	50	50
	1.6KV, Electrical pole included, electric pole interval 50 m	48.00	0	0	0	0	0	0	0	0	0
	Electric pole only	20.00	0	0	0	0	0	0	0	0	0
Optical cable	Electrical pole included, electric pole interval 50 m	30.00	0	0	0	0	0	0	0	0	0

Source: The Study Team

**Table 6.3.2 Compensation quantity and unit price for A Section**

Option	4-lane Option			2-lane Option			4-lane + 2-lane Option		
	1 (31.5m)	2 (24.0m)	3 (17.0m)	4 (15.0m)	5 (13.5m)	6 (10.5m)	7 (31.5m & 10.5m)	8 (24.0m & 10.5m)	9 (17.0m & 10.5m)
Item	Land compensation (m2) , Unit Price: 200USD/m2								
Section A-1	1,851	805	175	100	54	8	1,851	805	175
Section A2	A2-1	7,558	3,398	727	289	130	6	6	6
	A2-2	17,567	6,455	1,008	366	141	30	30	30
Total	26,976	10,658	1,910	755	325	44	2,157	841	211
Item	Building compensation (one-story) (m 2), Unit Price: 500USD/m2								
Section A-1	1,099	409	43	19	4	0	1,099	409	43
Section A2	A2-1	5,735	2,556	595	249	118	6	6	6
	A2-2	15,708	5,853	871	284	88	20	20	20
Total	Total	8,818	1,509	552	210	26	1,125	435	69
Item	Building compensation (more than two story) (m2) , Unit Price: 850USD/m2								
Section A-1	59	11	0	0	0	0	59	11	0
Section A2	A2-1	1,823	842	132	40	11	0	0	0
	A2-2	1,859	602	137	82	53	9	9	9
Total	3,741	1,455	269	122	64	9	68	20	9
Item	Relocation compensation (office), Unit Price: 900USD/m2								
Section A-1	78	36	9	6	6	0	78	36	9
Section A2	A2-1	408	321	159	123	63	9	9	9
	A2-2	720	537	327	132	72	12	12	12
Total	1,206	894	495	261	141	21	99	57	30
Item	Relocation compensation (household), Unit price: 900USD/m2								
Section A-1	0	0	0	0	0	0	0	0	0
Section A2	A2-1	101	46	8	3	1	0	0	0
	A2-2	87	33	9	6	4	1	1	1
Total	188	79	17	9	5	1	1	1	1

Source: The Study Team

**Table 6.3.3 Project Cost borne by DRC of A Section (unit: million US dollar)**

Option		4-lane Option			2-lane Option			4-lane + 2-lane Option		
		1 (31.5m)	2 (24.0m)	3 (17.0m)	4 (15.0m)	5 (13.5m)	6 (10.5m)	7 (31.5m & 10.5m)	8 (24.0m & 10.5m)	9 (17.0m & 10.5m)
Section A1	Water pipe relocation	0.429	0.429	0.284	0.284	0.284	0.284	0.42	0.42	0.284
	Electric tube relocation	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095
	Land acquisition	0.370	0.161	0.035	0.020	0.011	0.002	0.370	0.161	0.035
	Compensation	0.600	0.214	0.022	0.010	0.002	0.000	0.600	0.214	0.022
	Resettlement	0.070	0.032	0.008	0.005	0.005	0.00	0.070	0.032	0.008
	Sub-Total	1.564	0.931	0.444	0.414	0.397	0.381	1.555	0.922	0.444
Section A2-1	Water pipe relocation	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062
	Electric tube relocation	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032
	Land acquisition	1.512	0.680	0.145	0.058	0.026	0.001	0.001	0.001	0.001
	Compensation	4.417	1.994	0.410	0.159	0.068	0.003	0.003	0.003	0.003
	Resettlement	0.458	0.330	0.150	0.113	0.058	0.008	0.008	0.008	0.008
	Sub-Total	6.481	3.098	0.799	0.424	0.246	0.106	0.106	0.106	0.106
Section A2-2	Water pipe relocation	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113
	Electric tube relocation	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065
	Land acquisition	3.513	1.291	0.202	0.073	0.028	0.006	0.006	0.006	0.006
	Compensation	9.434	3.438	0.552	0.212	0.089	0.018	0.018	0.018	0.018
	Resettlement	0.726	0.513	0.302	0.124	0.068	0.012	0.012	0.012	0.012
	Sub-Total	13.851	5.42	1.234	0.587	0.363	0.214	0.214	0.214	0.214
Total	Water pipe relocation	0.604	0.604	0.459	0.459	0.459	0.459	0.595	0.595	0.459
	Electric tube relocation	0.192	0.192	0.192	0.192	0.192	0.192	0.192	0.192	0.192
	Land acquisition	5.395	2.132	0.382	0.151	0.065	0.009	0.377	0.168	0.042
	Compensation	14.451	5.646	0.984	0.381	0.159	0.021	0.621	0.235	0.043
	Resettlement	1.254	0.875	0.460	0.242	0.131	0.020	0.090	0.052	0.028
	Total	21.896	9.449	2.477	1.425	1.006	0.701	1.875	1.242	0.764

Source: The Study Team

## CHAPTER 7 Initial Environmental Examinations

### 7.1 Objectives

This initial environmental examination aims to study the existing condition of University Avenue and its surroundings and to develop the Terms of Reference for the EIA study that will be implemented in the next phase of the Project.

### 7.2 Environmental Examinations

#### 7.2.1 Project Components and Standard Impacts Expected

The Project is the improvement (and/or widening in parts) of the existing University Avenue. Expected project components and typical impacts from such activities are shown in Table 7.2.1.

Since air and noise pollution from passing vehicles already exists in the area, the most significant impacts are observed to be the loss of private properties, felling of roadside trees, and temporal or permanent unavailability of the roadside space during and after the Construction Phase.

**Table 7.2.1 Project Components and Typically Expected Environmental and Social Impacts**

Phase	Project components and activities		Typical impacts from project components and activities
Planning phase	Demarcation of work area	<ul style="list-style-type: none"> <li>● Notification of the Project and restriction of land use</li> <li>● Land acquisition</li> <li>● Staking and construction of border fence</li> <li>● Lease contract of land parcel(s) for stock yard, site office, etc.</li> <li>● Decision of trees to be felled</li> </ul>	<ul style="list-style-type: none"> <li>● Notification of unavailability and relocation of existing land use and trespassing (vendor shack, utilities (electric poles, underground utilities, utilities attached to the existing bridge structure), road and foot path, foot path to the river, etc.)</li> <li>● Notification of loss of private properties</li> <li>● Temporary ban of use of the land parcel(s) selected for stock yard, etc.</li> </ul>
		Preparation	
Construction phase	Set up of stock yard	<ul style="list-style-type: none"> <li>● Set up of concrete yard</li> <li>● Set up of asphalt plant</li> <li>● Storage of oils and chemicals</li> <li>● Machine repair, re-fuelling</li> </ul>	<ul style="list-style-type: none"> <li>● Risk of oil and chemical spill (soil contamination)</li> <li>● Generation of water demand for the concrete plant</li> <li>● Storage of asphalt materials</li> <li>● Concrete and asphalt may be procured from the market</li> </ul>
		<ul style="list-style-type: none"> <li>● Storage of other materials and tools</li> </ul>	<ul style="list-style-type: none"> <li>● Risk of robbery (crime)</li> </ul>
	Set up of office	<ul style="list-style-type: none"> <li>● Existence of engineers and office staff</li> </ul>	<ul style="list-style-type: none"> <li>● Water demand</li> <li>● Generation of waste water</li> <li>● Generation of sewer</li> <li>● Generation of wastes</li> </ul>
	Set up of work area	<ul style="list-style-type: none"> <li>● Existence of work crew</li> </ul>	<ul style="list-style-type: none"> <li>● Water demand</li> <li>● Generation of waste water</li> <li>● Generation of sewer</li> <li>● Generation of wastes</li> </ul>

Phase	Project components and activities		Typical impacts from project components and activities
	Removal works (existing roads, bridges, etc.)	<ul style="list-style-type: none"> <li>● Removal of existing structures and vegetation</li> <li>● Removal and relocation of utilities in ROW</li> </ul>	<ul style="list-style-type: none"> <li>● Generation of construction waste</li> <li>● Generation of needs for alternate water sources</li> </ul>
	Set up and removal of temporal structures (detour road, etc.)	<ul style="list-style-type: none"> <li>● Slow speed at the detour road</li> <li>● Removal of existing structures and vegetation</li> </ul>	<ul style="list-style-type: none"> <li>● Increased risk of local occurrence of traffic jam</li> <li>● Increased risk of occurrence of traffic accidents</li> <li>● Generation of construction waste</li> </ul>
	Earth works	<ul style="list-style-type: none"> <li>● Alteration of height of road surface by filling (at the sections lower than adjacent roadside)</li> <li>● Procurement of fill material</li> </ul>	<ul style="list-style-type: none"> <li>● Alteration of land form (at quarry site)</li> </ul>
		<ul style="list-style-type: none"> <li>● Generation of transportation vehicle (mainly to transport road bed and pavement material)</li> </ul>	<ul style="list-style-type: none"> <li>● Generation of exhaust gas(off-site)</li> <li>● Generation of noise (off-site)</li> <li>● Generation of traffic jam (off-site)</li> <li>● Increased risk of accidents (off-site)</li> </ul>
	Construction general	<ul style="list-style-type: none"> <li>● Operation of construction machinery and vehicles</li> <li>● Use of generators</li> </ul>	<ul style="list-style-type: none"> <li>● Emission of exhaust</li> <li>● Emission of noise</li> </ul>
		<ul style="list-style-type: none"> <li>● Disposal of construction wastes</li> </ul>	<ul style="list-style-type: none"> <li>● Disposal of construction wastes</li> </ul>
		<ul style="list-style-type: none"> <li>● Generation of employment</li> <li>● Procurement of materials, etc.</li> </ul>	<ul style="list-style-type: none"> <li>● Direct and indirect positive impact to local economy</li> </ul>
Maintenance phase	Opening of new road sections Existence of upgraded road		<ul style="list-style-type: none"> <li>● Improved traffic network in Kinshasa, that leads to less emission of exhaust gas and noise along existing arterial road</li> <li>● Increased generation of exhaust gas</li> <li>● Increased generation of noise</li> <li>● Existence of major bridge in tidal area</li> </ul>

The necessity of workers camp cannot be decided at this phase of the Study.

Source: The Study Team

## 7.2.2 Legal Framework of EIA

### (1) DRC Decree on EIA

Based on Articles 19, 21, 23 and 24 of the ‘Loi no. 11/009 du 09 juillet 2011 portant principes fondamentaux relatifs à la protection de l’environnement’, the Decree on laying down the rules for the functioning of the procedural mechanisms for the protection of the environment (*Décret no. 14/019 du 02 août 2014 fixant les règles de fonctionnement des mécanismes procéduraux de la protection de l’environnement*) is prepared for the environmental and social review of development projects. (Table 7.2.2)

**Table 7.2.2 Structure of the Decree**

Title I : General Provisions
Title II : Strategic Environmental Assessment (SEA)
Title III: Impact Assessment Environmental and Social (ESIA)
Title IV: Conditions and Modalities of Realization of The Environmental Audit
Title V : The Procedure of The Environmental Public Survey
Title VI: Criminal, Transitional, Submission and Final Provisions

Source: *Décret no. 14/019 du 02 août 2014 fixant les règles de fonctionnement des mécanismes procéduraux de la protection de l'environnement*

Note: SEA and ESIA stand for "Strategic Environmental Assessment" and "Environmental and Social Impact Assessment", respectively

According to the Title III of the Decree, an environmental and social impact assessment, together with its management plan, must be submitted to any development, infrastructure or exploitation project of any industrial, commercial, agricultural, forestry, mining, hydrocarbons, cement, telecommunication or other materials likely to have an impact on the environment, including all road construction and development projects.

Article 20 of the decree states that the Operations Manual and Procedures will detail the process for carrying out environmental and social impact assessments. The Manual, however, is not published as of 2019, and the process of reviewing EIA is conducted case by case.

According to the Article 23 and 24, the Project Owner must apply for an Environmental Certificate to the agency, ACE. When an EIA is required, the agency will issue an official TOR for the study. In case of the SEA of the MP, the official TOR was issued about 60 calendar days after the start of negotiation by the Study Team. Based on the TOR, a national consultant certified by Ministry of Environment will conduct the EIA study. Based on the opinion of local consultant that assisted the M/P study, the EIA study for the University Avenue improvement project may be finished within 2 months. When the EIA study is submitted to the authority, the Project Owner must pay the agency the fee to review the report (ARRETE MINISTERIEL No 29 /CAB/MIN/ECNDD/23/RBM/2016). It will take the agency 3 months before it reports back to the Project Owner whether the Project is accepted and the Environmental Certificate (EC) to be issued, or the report is returned for revision (Article 27). The revision must be done within 30 days. After the EC is issued, but before the start of construction works, the Project Owner must submit an environmental management plan to the agency. The agency will review to validate the plan within 60 days (Article 32).

## **(2) Institutional Situation**

The Congolese Environment Agency (ACE, *Agence Congolaise de l'Environnement*) is responsible for screening development projects and ordering the project proponents in order to conduct environmental and social impact study, and to develop environmental management plans for implementation.

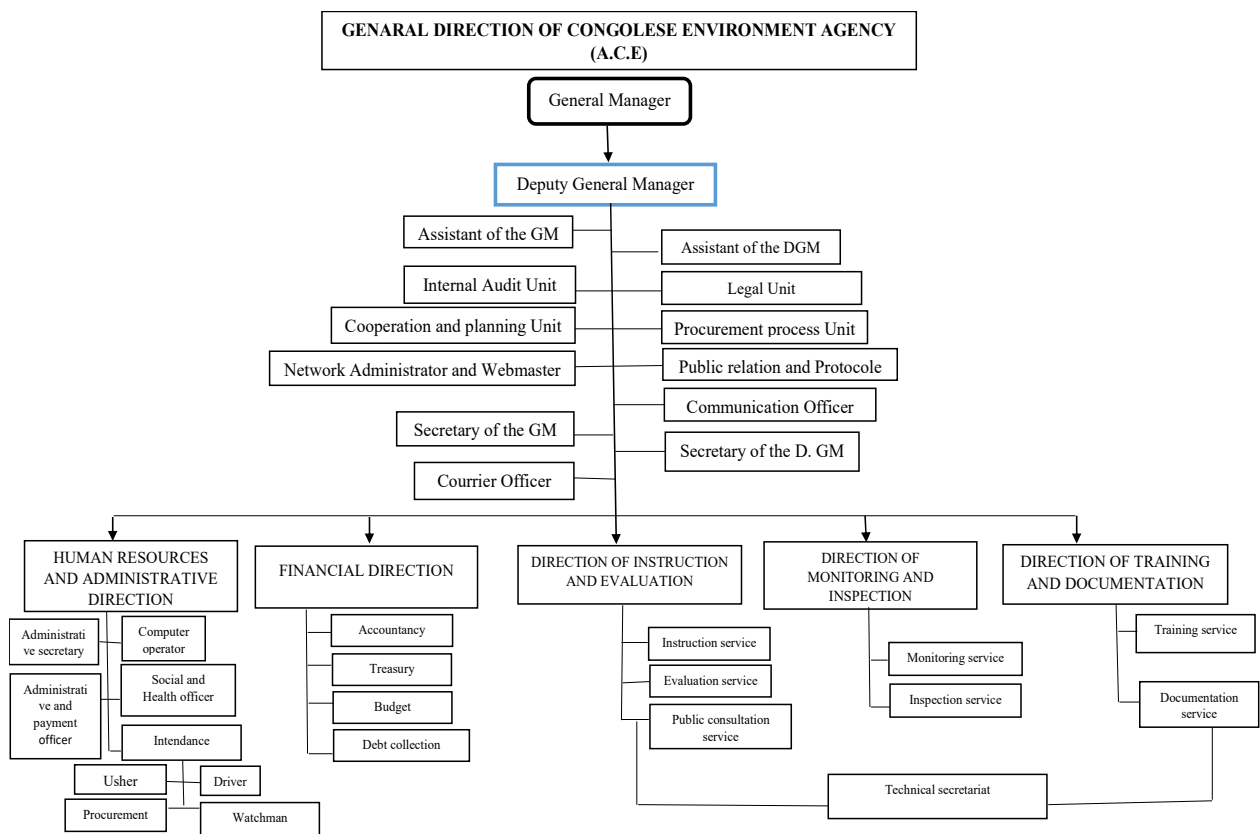
According to "Article 22 of Law No. 11/009 09 July 2011 - Basic Principles on the protection of the environment" and "Article 1 of Decree No. 14/030 of 18 November 2014" that lays down the statutes of a public institution called Congolese Environment Agency (ACE), the Environmental Studies Group of Congo (GEEC) has been dissolved and its staff is paid to the Agency (confers Article 41 of the Decree cited above).



For this purpose, the missions of the ACE as described in Article 3 of the aforementioned decree are provided as follows:

- Evaluate and approve all environmental and social studies as well as monitoring their implementation;
- Ensure the consideration of the protection of the environment in the execution of any development, infrastructure or exploitation project of any industrial, commercial, agricultural, forestry, mining, telecommunications or other activity likely to have an impact on the environment.

The institutional structure as of April 6, 2017 is shown in Figure 7.2.1. The process of SEA and EIA (ESIA) review is handled by the Director of Monitoring and Inspection.



Source: The Study Team

**Figure 7.2.1 Institutional Structure of ACE as of April 2017**

The annual average budget allocated is USD665,840, however, the actual expenses incurred is USD 447,600.

There are 34 officers who are responsible exclusively for SEA, ESIA and RAP, whereas the total number of staff in ACE is 62.

The institutional situation of ACE has been changed to strengthen its capacity in 2018. Updated information was requested in November 2018, but the reply has not been obtained as of January 2019.

### **(3) JICA Guidelines**

According to “JICA Guidelines for Environmental and Social Considerations 2010”, shown in Table 7.2.3, the Project will fall in either Category A or Category B, mainly depending upon the size of relocations in this case.

**Table 7.2.3 Categorization Criteria of JICA Guideline**

<b>Category</b>	<b>Categorization Criteria</b>
Category A	<ul style="list-style-type: none"> <li>● Proposed projects are classified as Category A if they are likely to have significant adverse impacts on the environment and society.</li> <li>● Projects with complicated or unprecedented impacts that are difficult to assess, or projects with a wide range of impacts or irreversible impacts, are also classified as Category A.</li> <li>● These impacts may affect an area broader than the sites or facilities subject to physical construction.</li> <li>● Category A, in principle, includes projects in sensitive sectors, projects that have characteristics that are liable to cause adverse environmental impacts, and projects located in or near sensitive areas.</li> </ul>
Category B	<ul style="list-style-type: none"> <li>● The project may have adverse impacts on the environment or society, but these impacts are less significant than those of Category A projects.</li> <li>● These impacts are site-specific; few, if any, of them are irreversible; in most cases, they can be mitigated more readily than Category A projects.</li> <li>● Responsibilities of the project proponents include the planning and monitoring of necessary Environmental and Social Consideration (ESC) activities.</li> <li>● ESC procedures such as Strategic Environmental Assessment for Master Plan projects and stakeholder participation may be required, depending on the scale and nature of the adverse impacts.</li> </ul>

Source: JICA Guideline 2010

### **(4) GAP Analysis**

Table 7.2.4 summarizes the key differences between the JICA Guidelines and DRC’s EIA Notification 2006 and its amendments. The policy of the Project to bridge the gaps is also explained in Table 7.2.4.

**Table 7.2.4 GAP Analysis**

Target	JICA Guideline	DRC Decree on EIA	Gaps Between JICA Guidelines and EIA Decree, Bridging Measures
Underlying Principles	<ul style="list-style-type: none"> <li>Environmental impacts that may be caused by projects must be assessed and examined in the earliest possible planning stage. Alternatives or mitigation measures to avoid or minimize adverse impacts must be examined and incorporated into the project plan. JICA Guidelines Appendix 1, 1.1</li> </ul>	<ul style="list-style-type: none"> <li>EIA Decree stipulates the processes of EIA and ACE is made responsible for EIA review well before the aimed start of construction works.</li> <li>After an Environmental Certificate is awarded, the Project Owner must submit an environmental mitigation and monitoring plan for validation.</li> </ul>	<ul style="list-style-type: none"> <li>No gap exists.</li> <li>It is desirable to closely monitor the implementation of the mitigation measures implemented by the Project Owner and the Contractor in the Construction Phase.</li> </ul>
Information dissemination	<ul style="list-style-type: none"> <li>EIA reports (which may be referred to differently in different systems) must be written in the official language or in a language widely used in the country in which the project is to be implemented. When explaining projects to local residents, written materials must be provided in a language and form understandable to them;</li> </ul>	<ul style="list-style-type: none"> <li>Article 56. The prior communication of the project to the stakeholders, in French, in the national language of the environment and in the language understood by them.</li> </ul>	<ul style="list-style-type: none"> <li>No gap exists.</li> <li>EIA Report for this Project to be prepared in French and Lingala, the local community language.</li> </ul>
	<ul style="list-style-type: none"> <li>EIA reports are required to be made available to the local residents of the country in which the project is to be implemented. The EIA reports are required to be available at all times for perusal by project stakeholders such as local residents and copying must be permitted; Appendix 2 Forewords</li> </ul>	<ul style="list-style-type: none"> <li>Article 60. Publication of the investigation report shall be carried out by all means of communication accessible to the public in the project area, in French and in the national language of the site.</li> <li>A copy is reserved for the Minister and the sectoral ministers concerned by the project for disposition.</li> </ul>	<ul style="list-style-type: none"> <li>Explanation also is planned to be conducted in Lingala in principle for better understanding of the residents.</li> <li>No fundamental gap exists. However, EIA Decree is not clear enough about how to make the report accessible to the public.</li> <li>In the F/S phase, the JICA Study Team needs to persuade ACE and CI to disclose the draft EIA report at Commune Offices and Public Libraries.</li> </ul>
Social Acceptability	<ul style="list-style-type: none"> <li>For projects with a potentially large environmental impact, sufficient consultations with local stakeholders, such as local residents, must be conducted via disclosure of information at</li> </ul>	<ul style="list-style-type: none"> <li>No specific treatment for projects with a potentially large environmental impact is described in the Decree.</li> </ul>	<ul style="list-style-type: none"> <li>In the Pre-F/S phase, the alternatives of the University Avenue improvement projects are submitted to stakeholders for open discussions. The most suitable plan for realization will be chosen through</li> </ul>

	<p>an early stage, at which time alternatives for project plans may be examined. The outcome of such consultations must be incorporated into the contents of project plans. Appendix 1, 5.1</p>		<p>further discussion among the stakeholders. The outcome of such discussions and decision makings will be the framework of the Project design to be studied in the next F/S phase.</p>
	<ul style="list-style-type: none"> <li>● In preparing EIA reports, consultations with stakeholders, such as local residents, must take place after sufficient information has been disclosed. Records of such consultations must be prepared;</li> </ul>	<ul style="list-style-type: none"> <li>● Article 2. Item 16 defines Stakeholders as follows: natural or legal persons, local communities, indigenous peoples, politico-administrative authorities, village associations and legally recognized non-governmental organizations that may be directly or indirectly affected by the project. Universities, higher institutes and research centres whose work is of such a nature as to shed light on the investigation may also be considered as stakeholders.</li> </ul>	<ul style="list-style-type: none"> <li>● Customarily, public consultations are held at the timing of EIA draft report. Public consultation at the scoping/TOR phase is not required.</li> <li>● In the Pre-F/S phase, the JICA Study Team held tri-party meeting with CI and ACE about necessary EIA procedure in the F/S Phase. The JICA Study Team explained that the JICA Guidelines require first public consultation in Scoping Phase. Other two parties agreed to follow the Guidelines.</li> </ul>
	<ul style="list-style-type: none"> <li>● Consultations with relevant stakeholders, such as local residents, should take place if necessary throughout the preparation and implementation stages of a project. Holding consultations is highly desirable, especially when the items to be considered in the EIA are being selected, and when the draft report is being prepared. Appendix 2 Forewords</li> </ul>	<ul style="list-style-type: none"> <li>● Article 56. The public inquiry is carried out in two stages: <ul style="list-style-type: none"> <li>➢ The prior communication of the project to the stakeholders, in French, in the national language of the environment and in the language understood by them;</li> <li>➢ Collecting assessments, suggestions and counter-proposals from stakeholders.</li> </ul> </li> <li>● The duration of the public inquiry shall not exceed two months.</li> </ul>	<ul style="list-style-type: none"> <li>● The Decree does not mention about the communication in the implementation (construction) stage.</li> <li>● In the F/S stage, The JICA Study Team must encourage the Project Owner to set up the communication window for public during the Construction Phase and publicize the communication measures.</li> </ul>
Scope of Impacts to Be Assessed	<ul style="list-style-type: none"> <li>● 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</li> </ul>	<ul style="list-style-type: none"> <li>● Article 19 describes ten elements need to be included in an EIA report that include the items listed in the left column.</li> </ul>	<ul style="list-style-type: none"> <li>● No gap exists.</li> <li>● Upon receiving the Project Proposal from CI, ACE will issue official TOR of EIA including table of contents to be covered in the Report.</li> <li>● The Official TOR will also list the experts necessary to be hired to conduct the survey.</li> </ul>

	<p>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. Appendix 1, 3.1</p>		
	<ul style="list-style-type: none"> <li>● In addition to the direct and immediate impacts of projects, their derivative, secondary, and cumulative impacts as well as the impacts of projects that are indivisible from the project are also to be examined and assessed to a reasonable extent. It is also desirable that the impacts that can occur at any time throughout the project cycle should be considered throughout the life cycle of the project. Appendix 1. 3.2</li> </ul>	<ul style="list-style-type: none"> <li>● Article 19 (G) requires identifying, analysing and evaluating the foreseeable direct, indirect and cumulative impacts of the project and its environmental performance options.</li> </ul>	<ul style="list-style-type: none"> <li>● No gap exists.</li> </ul>
Monitoring and resolving problems	<ul style="list-style-type: none"> <li>● Project proponents etc. should make efforts to make the results of the monitoring process available to local project stakeholders. Appendix 1, 9.3</li> </ul>	<ul style="list-style-type: none"> <li>● Chapter 6 of the Decree covers the monitoring activities. No obligation for publicizing the monitoring results to the stakeholders is required for the Project Owner.</li> </ul>	<ul style="list-style-type: none"> <li>● During the preparation of the Monitoring Plan in the F/S phase of the Project, the JICA Study Team must consult and agree with the Project Owner for the suitable publication measures of the monitoring results.</li> </ul>
	<ul style="list-style-type: none"> <li>● 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</li> </ul>	<ul style="list-style-type: none"> <li>● No specific descriptions are given in the Decree about the operation in case any claim is raised against the rationality of the environmental and social considerations of a project.</li> </ul>	<ul style="list-style-type: none"> <li>● In the F/S phase of the Project, the JICA Study Team shall discuss with the Project Owner and ACE and develop a procedure plan against any claim about the rationality of the environmental and social considerations of a project.</li> </ul>

	<p>in relevant projects. Project proponents etc. should make efforts to reach an agreement on procedures to be adopted with a view to resolving problems. Appendix 1, 9.4.</p>		
Ecosystem and Biota	<ul style="list-style-type: none"> <li>Projects must not involve significant conversion or significant degradation of critical natural habitats and critical forests. Appendix 1. 6.1.</li> </ul>	<ul style="list-style-type: none"> <li>The EIA process and issuance of the Environmental Certificate is governed by Minister of the Environment, Conservation of Nature and Tourism. It is therefore expected that projects that involve significant conversion or significant degradation of critical natural habitats and critical forests will be carefully examined not only by ACE but also by relevant authorities.</li> </ul>	<ul style="list-style-type: none"> <li>No direct mention in the EIA Decree exists.</li> <li>So far, the Project is not expected to affect any significant natural habitat since the Project is located in urban environment.</li> <li>In the F/S phase, the Consultant must carefully re-examine the possibility of occurrence of significant natural habitats. If any found, impacts must be avoided or minimized as much as feasible.</li> </ul>
Indigenous Peoples	<ul style="list-style-type: none"> <li>Any adverse impacts that a project may have on indigenous peoples are to be avoided when feasible by exploring all viable alternatives. When, after such an examination, avoidance is proved unfeasible, effective measures must be taken to minimize impacts and to compensate indigenous peoples for their losses. Appendix 1, 8.1.</li> </ul>	<ul style="list-style-type: none"> <li>Article 2 of the Decree includes indigenous people in the definition of the stake holders.</li> </ul>	<ul style="list-style-type: none"> <li>No specific attention is given and indigenous people are among many groups to be included in the stake holders.</li> <li>So far, the Project is not expected to affect any specific indigenous groups since the Project is located in urban environment.</li> <li>In the F/S phase, the Consultant must carefully re-examine the possibility of indigenous groups among the PAs. If any found, impacts must be avoided or minimized as much as feasible.</li> </ul>

Source: The Study Team

### 7.2.3 Alternatives of the Project

University Avenue is divided into Section A (Sendwe IS - RP Ngaba) and Section B (RP Ngaba - UNIKIN) from the viewpoint of the convenience to the project implementation. To pursue the realistic implementation plan of the Project (Section A), alternatives are prepared by combining two major components, such as number of lanes and width of the typical sections. Alternatives accompanied by options which vary with such options as lane numbers and road width are summarized in Table 7.2.5.

According to the Master Plan, University Avenue is planned to be a 4-lane road entirely by the year 2030. However, the existing road only allows the space for 4-lane road between Sendwe IS and Yolo-Ezo IS (Section A1) but it can hardly achieve the same road width between Yolo-Ezo IS

and RP Ngaba (Section A2). Thus, only the 2-lane road is affordable in this section, if no widening of ROW is implemented.

In addition, Section A2 is further divided into sub-section A2-1 (Yolo-Ezo IS – Kianza Avenue) and sub-section A2-2 (Kianza Avenue – RP Ngaba) in order to increase the potential of project realization.

The No-project Option cannot be acceptable, because the existing University Avenue is not passable by vehicular traffic in a few locations, and delay in the project implementation is believed to occur due to far larger amount of relocation and loss of private properties considering numerous on-going building constructions along the road.

**Table 7.2.5 Project Alternatives**

Alternatives	Number of Lanes and Road Width by Section			Pros	Cons
	Section A1 BP – PK3.5 km	Section A2-1 PK3.5 - PK4.3 km	Section A2-2 PK4.3 - PK6.1 km		
Option 0 (No project)	Existing (about 22.0 - 50.0 m)	Existing (about 12.0 - 20.0 m)	Existing (about 12.0 - 20.0 m)	No relocation of businesses and households	Large relocation will be necessary in future improvement The road remains impassable at places and will not function as designed.
Option 1	4 lanes 31.5m	4 lanes 31.5m	4 lanes 31.5m	The road will have sufficient capacity up to 2030	The number of relocated businesses and households may be significant
Option 2	4 lanes 24m	4 lanes 24m	4 lanes 24m		
Option 3	4 lanes 17m	4 lanes 17m	4 lanes 17m		
Option 4	2 lanes 15m	2 lanes 15m	2 lanes 15m	All-year through traffic will be possible	The capacity of the road network will not match with the volume of traffic generated in future
Option 5	2 lanes 13.5m	2 lanes 13.5m	2 lanes 13.5m		
Option 6	2 lanes 10.5m	2 lanes 10.5m	2 lanes 10.5m		
Option 7	4 lanes 31.5m	2 lanes 10.5m	2 lanes 10.5m	All-year through traffic will be possible	The capacity of the road network will not match with the volume of traffic generated in future
Option 8	4 lanes 24m	2 lanes 10.5m	2 lanes 10.5m	4-lane, all-year road is secured for 3.5 km with minimum impact of relocation	The capacity of the road network will not match with the volume of traffic generated in future
Option 9	4 lanes 17m	2 lanes 10.5m	2 lanes 10.5m		

Source: The Study Team

## 7.2.4 Existing Environmental, Social and Economic Conditions

### (1) Communes and Quartiers to be Affected

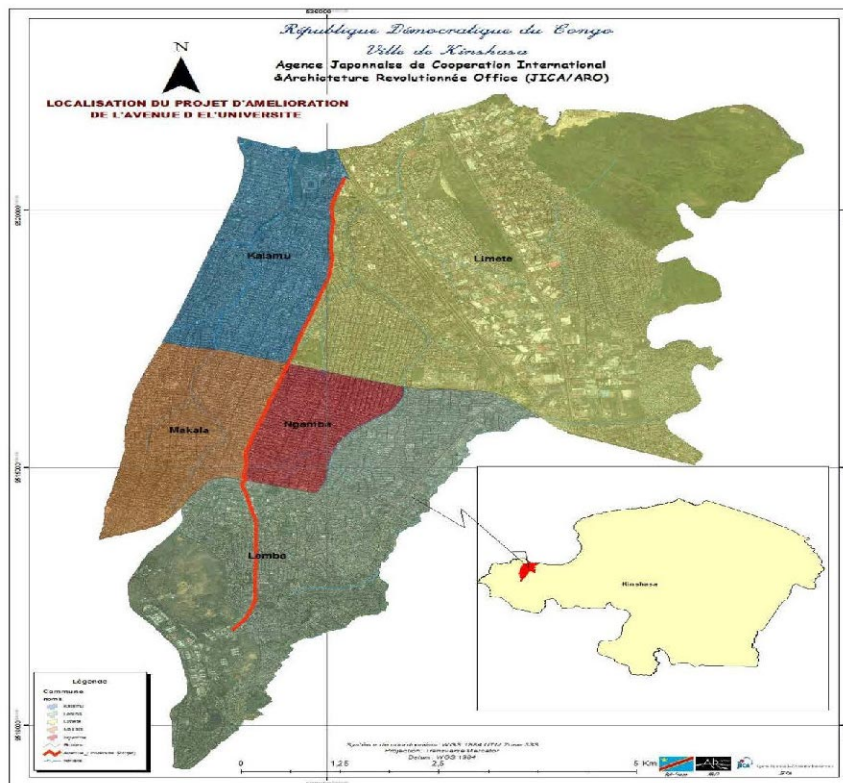
Section A runs on the border of four Communes (Figure 7.2.2). From Sendwe IS to Kikwit (about PK3.7 Km), the road runs between Limete and Kalamu communes. From Kikwit to RP Ngaba, the road runs between Ngaba and Makala Communes.

Since the land registration office is managed by each commune, special committees for asset assessment and compensation determination must be established in each commune during the planning and implementation phases.

**Table 7.2.6 Communes and Quartiers Affected by the Project**

Commune	Quartier	Commune	Quartier	Commune	Quartier	Commune	Quartier	Commune	Quartier
Limete	Mososo Mateba Agricole	Ngaba	Baobab Luyi Bulambemba	Kalamu	Immo-congo Kauka II Kauka III Yolo Nord I Yolo Sud I Pinzi	Makala	Uele Kabila Salongo Kwango Lemba Village	Lemba (Section B)	Salongo Kemi Livulu Mbanza Lemba

Source: The Study Team



Source: The Study Team

**Figure 7.2.2 Communes Affected by the Project**

**(2) Land Use along the Road**

As shown in Figure 7.2.3, the west side (right side) of University Avenue is basically kept as green open space up to Yolo-Ezo IS at PK3.5 Km. Open spaces under the trees and on the left side are used for various commercial activities. Buildings along the road are used for both commercial and residential purposes.

Between Yolo-Ezo IS and RP Ngaba, the buildings along the road become dominantly commercial. Residential structures are located either behind or above the shops.





Typical Section A-1

Typical Section A-2

Source: The Study Team

Figure 7.2.3 Land Use along the Road

### (3) Public and Community Facilities

Many schools, universities, hospitals and churches are located along the road. Functions of those facilities need to remain open during the Construction Phase of the Project.

Also, many police boxes using train containers, as well as waste collection points are located on the unused road space. House and commercial wastes are collected and brought to the collection points and about once a week, a dump truck gathers the wastes and transported to the landfill site located eastern part of Kinshasa. These functions need to be relocated during the Construction Phase, and re-installed at the same place or nearby after the Construction Phase.



School



Church



Police and Quartier Office



Waste collection point

Source: The Study Team

Figure 7.2.4 Public and Community Facilities along the Road

#### **(4) Sanitary Condition**

In addition to the miserable condition of the waste collection points, waste water from houses and markets overflow on to the road surface, especially after raining. Such over flow on earth-surfaced road ditches along the road. As shown in Figure 7.2.3, the west side (right side) of University Avenue is basically kept as green open space up to Yolo-Ezo IS at PK3.5 Km. Open spaces under the trees and on the left side are used for various commercial activities. Buildings along the road are used for either commercial or residential purposes.



**Blocked ditch (on the right)**



**Stagnant water on the road**

Source: The Study Team

**Figure 7.2.5 Sanitary Condition on the Road**

#### **7.2.5 Scoping of Potential Impacts and IEE Level Survey Methods**

Based on the project components and existing environmental and social conditions, items expected to be affected by the project were selected as shown in Table 7.2.7.

Surveys for IEE level, such as field observations, interviews with local residents, and observation of similar roads in Kinshasa City, were conducted to predict and assess the significance of the likely impacts.

**Table 7.2.7 Scoping of Potential Impacts**

No	Identification of impact sources	Evaluation during the construction phase	Evaluation during the operation phase	Rationale of Evaluation
1	Air pollution	B-	B-	<ul style="list-style-type: none"> <li>– Construction works on the existing road will cause dust and exhaust pollution during the Construction Phase.</li> <li>– In the Operation Phase, traffic volume on wider road will increase compared to existing condition.</li> </ul>
2	Water pollution	B-	D	<ul style="list-style-type: none"> <li>– Construction works on the existing road will cause muddy water runoff during the Construction Phase.</li> <li>– No additional water pollution will be generated by the simple existence of the road in the Operation Phase.</li> </ul>
3	Wastes	B-	D	<ul style="list-style-type: none"> <li>– Construction works will generate wastes.</li> <li>– No additional wastes will be generated by the simple existence of the road in the Operation Phase.</li> </ul>
4	Soil pollution	B-	D	<ul style="list-style-type: none"> <li>– Oils and chemicals used in the construction works may contaminate soil in the work area.</li> <li>– No additional spills will be generated by the simple existence of the road in the Operation Phase.</li> </ul>
5	Noise and Vibration	B-	B-	<ul style="list-style-type: none"> <li>– Construction works on the existing road will cause noise and vibration during the Construction Phase.</li> <li>– In the Operation Phase, traffic on wider road may cause more noise and vibration compared to the existing condition.</li> </ul>
6	Ground subsidence	D	D	<ul style="list-style-type: none"> <li>– No ground subsidence will be generated from implementation of the project.</li> </ul>
7	Offensive odour	D	D	<ul style="list-style-type: none"> <li>– No offensive odour will be generated from implementation of the project.</li> </ul>
8	Pollution of bottom sediments	B-	D	<ul style="list-style-type: none"> <li>– Oils and chemicals used in the construction works may contaminate soil in the work area.</li> <li>– No additional spills will be generated by the simple existence of the road in the Operation Phase.</li> </ul>
9	Protected areas	D	D	<ul style="list-style-type: none"> <li>– No protected areas exist near University Avenue.</li> </ul>
10	Ecosystem	D	D	<ul style="list-style-type: none"> <li>– The target road is located in urban environment and no important ecosystem that need attention exists in the area.</li> </ul>
11	Water regime	D	D	<ul style="list-style-type: none"> <li>– The target road is located in urban environment and no change of watershed is expected by the Project.</li> </ul>
12	Geology and topography	B-	D	<ul style="list-style-type: none"> <li>– Topography at the quarries may be changed by the Project.</li> <li>– No additional impact is expected during the</li> </ul>

No	Identification of impact sources	Evaluation during the construction phase	Evaluation during the operation phase	Rationale of Evaluation
				Operation Phase.
13	Land acquisition and involuntary resettlement of residents and businesses	C (A- or B-)	D	<ul style="list-style-type: none"> <li>– Land acquisition and involuntary resettlement will be necessary, but the significance is unknown.</li> <li>– No additional impact is expected during the Operation Phase.</li> </ul>
14	The poor	C (A- or B-)	B+	<ul style="list-style-type: none"> <li>– Those who belong to the poor group may be affected by land acquisition and involuntary resettlement, but the significance is unknown.</li> <li>– By improving traffic access, especially on foot and on public transportation, the Project will provide positive impacts in the Operation Phase.</li> </ul>
15	Indigenous or minority groups	C	C	<ul style="list-style-type: none"> <li>– Since the width of the road expansion is not decided yet, and the character of persons to be affected is not interviewed yet, the significance of impact is unknown.</li> </ul>
16	Local economy such as employment and livelihood	C (A- or B-)	B+	<ul style="list-style-type: none"> <li>– Local economy may be affected in the Construction Phase, but the significance is unknown.</li> <li>– By improving traffic access, the Project will provide positive impacts on local economy in the Operation Phase.</li> </ul>
17	Land use and local resource use	B-	D	<ul style="list-style-type: none"> <li>– Those who cultivate the unused road space and those who engage in informal business on the unused road space may affect negatively on the household income of the poor group.</li> <li>– The area along the University Avenue is already urban. No significant change will be generated in the Operation Phase.</li> </ul>
18	Water use	B-	D	<ul style="list-style-type: none"> <li>– Construction works and restriction of movement may affect negatively on access to water.</li> <li>– No additional impact will be caused by the road in the Operation Phase.</li> </ul>
19	Traffic facilities, public facilities, infrastructures, and their services	B-	B+	<ul style="list-style-type: none"> <li>– Construction works and restriction of movement may affect negatively on infrastructure functions.</li> <li>– In the Operation Phase, traffic facilities will be improved and many public facilities will be accessed easily.</li> </ul>
20	Social institutions such as social infrastructure, social capital, and local decision - making institutions	D	D	<ul style="list-style-type: none"> <li>– Since the project is an improvement of the existing road, no change or impacts are expected on existing social institutions.</li> </ul>

No	Identification of impact sources	Evaluation during the construction phase	Evaluation during the operation phase	Rationale of Evaluation
21	Uneven distribution of benefits and damages	D	D	– The improvement of University Avenue will benefit all along the road by providing secured all-year road access.
22	Local conflict of interests	D	D	– Since the improvement of University Avenue will benefit all along the road by providing secured all-year road access, no local conflict of interests is expected.
23	Cultural Heritage	B-	D	<ul style="list-style-type: none"> <li>– Cultural heritage refers to sites of cultural, historical or archaeological importance that may be affected by the project.</li> <li>– Although the width of the road is not decided yet, some resources may be affected by the construction works.</li> <li>– In the operation phase, no additional negative impacts will be generated.</li> </ul>
24	Landscape	B-	D	<ul style="list-style-type: none"> <li>– The Project will modify the landscape in relation to the works and the widening of the road right-of-way.</li> <li>– In the operation phase, no additional negative impacts will be generated.</li> </ul>
25	Gender	B-	B+	<ul style="list-style-type: none"> <li>– In the Construction Phase, unavailability of water, ban of cultivation may heavily affect women.</li> <li>– In the operation phase, women will benefit from smooth and easy access to markets, hospitals and other social facilities with improved road.</li> </ul>
26	Children's rights	B-	B+	<ul style="list-style-type: none"> <li>– Under-aged children may be hired in the construction works.</li> <li>– In the operation phase, children will benefit from smooth and easy access to schools, hospitals and other social facilities with improved road.</li> </ul>
27	Transmittable diseases including HIV/AIDS	B-	D	<ul style="list-style-type: none"> <li>– Malaria and other diseases transmitted by mosquitoes may occur from stagnant water in work areas.</li> <li>– Migrant labourers including construction workers are risk population of HIV/AIDS in many countries. If migrant labourers are hired for the project, the local risk of HIV/AIDS may become higher.</li> <li>– No additional negative impacts are expected in the operation phase, since the project is a city-scale project and will not invite regional or national scale of population movement.</li> </ul>

No	Identification of impact sources	Evaluation during the construction phase	Evaluation during the operation phase	Rationale of Evaluation
28	Work safety, work environment	B-	D	<ul style="list-style-type: none"> <li>– Work related accidents may occur during the Construction Phase.</li> <li>– No additional negative impacts are expected in the operation phase.</li> </ul>
29	Accident	B-	B+	<ul style="list-style-type: none"> <li>– Construction works and restriction of movement may affect negatively on road safety.</li> <li>– In the operation phase, fewer traffic accidents will occur with improved roads, sidewalks, and road crossing facilities.</li> </ul>
30	Climate change, transboundary impacts	B-	B+	<ul style="list-style-type: none"> <li>– Emission of greenhouse gas from construction machineries and transport vehicles will occur during the Construction Phase.</li> <li>– In the Operation Phase, smoother traffic movement will lead to lower consumption of fuel, and lower emission of greenhouse gases.</li> </ul>

Note:

A+/- A remarkably positive / serious negative impact is predicted

B+/- A positive / negative impact is expected to some extent

C The extent of the impact is unknown. (Further study is required.)

D The impact is very low or zero and no further survey is required

Source: The Study Team

### 7.2.6 IEE Level Survey Results and Impact Assessment

Field observations, interviews and literature surveys were conducted in November 2018. The survey results and impact assessment are shown in Table 7.2.8.

**Table 7.2.8 Assessment of Potential impacts and Their Scope**

No	Identification of impact sources	Evaluation during the construction phase	Evaluation during the operational phase	Reasons for Evaluation
1	Air pollution	B-	B-	<ul style="list-style-type: none"> <li>– In the construction phase, the impact on houses along the road will be negative but with normal construction level. There will be air pollution due to the transport of materials, stripping and compaction, the road construction works, etc.</li> <li>– In the operating phase, this impact will be generated by the exhaust gases from vehicles and motorcycles that will use University Avenue.</li> </ul>
2	Water pollution	B-	B-	<ul style="list-style-type: none"> <li>– In the construction phase, impact on water pollution in the drainage and small rivers concerns the runoff and infiltration of hydrocarbons, used oil, but also liquid and solid waste. It was considered negative but the level of impacts will be the same as with normal construction works.</li> <li>– During the operation phase, water pollution in the drainage and small rivers will always remain and will be caused by the oil spill from vehicles, in addition to housing waste water, on University Avenue.</li> </ul>
4	Wastes	B-	D	<ul style="list-style-type: none"> <li>– In construction, this impact will be negative but the level will be the same with normal construction project. The major wastes to be generated will include removed asphalt and concrete, removed soil, and bags and containers of construction materials.</li> <li>– During the operational phase, the project will not generate waste.</li> </ul>
3	Soil pollution	B-	B-	<ul style="list-style-type: none"> <li>– During the Construction and Operation Phase, wastes, oil spill and lubricants from vehicles and stock yards may cause soil pollution.</li> </ul>
5	Noise and Vibration	B-	B-	<ul style="list-style-type: none"> <li>– The impact on noise and vibration was considered negative but the level will be the same with normal construction works. It will be produced from the noises of heavy and light machinery, grinders, compacters, etc.</li> <li>– During operation, the noise from passing vehicles will be generated at the project area.</li> </ul>
6	Ground subsidence	D	D	<ul style="list-style-type: none"> <li>– No ground subsidence will be generated from implementation of the project.</li> </ul>

No	Identification of impact sources	Evaluation during the construction phase	Evaluation during the operational phase	Reasons for Evaluation
7	Offensive odour	D	D	– No offensive odour will be generated from implementation of the project.
8	Pollution of bottom sediments	B-	B-	<ul style="list-style-type: none"> <li>– In the construction phase the impact on bottom sediment pollution at adjacent small rivers will be negative. It will be caused by the runoff of physio-chemical particles from the work.</li> <li>– In the operation phase, this impact will be caused by the oil spill from vehicles on University Avenue.</li> </ul>
9	Protected areas	D	D	– No protected areas exist near University Avenue.
10	Ecosystem	D	D	– The target road is located in urban environment and no important ecosystem that need attention exists in the area.
11	Water regime	D	D	– The project will not change boundaries of existing watersheds. Therefore, no significant impacts on hydrology will be generated.
12	Geology and topography	D	D	– The construction materials such as sand and gravels will be purchased from market and no new quarry will be open for the project. Therefore, no significant impacts on geology and topography will be generated.
13	Land acquisition and involuntary resettlement of residents and businesses	C (A- or B-)	C (A- or B-)	<ul style="list-style-type: none"> <li>– Since the width of the road expansion is not decided yet, the significance of impact is unknown.</li> <li>– It is highly expected, however, that many commercial, business and residential structures along the target road will be subject for demolition due to the expansion of the road.</li> <li>– Businesses along the road includes; Banks, telephone booths, community halls, schools, churches, garages, car parks, restaurants, buildings with apartments for rent, hospitals, petrol stations, carpentry workshops, quado services, bakeries and car washes, markets, shops, pharmacies, shops and hardware stores.</li> <li>– In case appropriate compensation and assistances to recover the living standard of pre-project level, additional negative impacts will be generated in the Operation Phase.</li> </ul>
14	The poor	C (A- or B-)	B+	– Since the width of the road expansion is not decided yet, and the character of persons to be affected is not interviewed yet, the significance



No	Identification of impact sources	Evaluation during the construction phase	Evaluation during the operational phase	Reasons for Evaluation
				<p>of impact is unknown.</p> <ul style="list-style-type: none"> <li>– With appropriate compensation and assistances to recover the living standard of pre-project level, no additional impacts will be generated in the operation phase.</li> <li>– Those who cannot afford private cars will benefit with secured, better access to all-year road and public transportation.</li> </ul>
15	Indigenous or minority groups	C	C	<ul style="list-style-type: none"> <li>– Since the width of the road expansion is not decided yet, and the character of persons to be affected is not interviewed yet, the significance of impact is unknown.</li> <li>– In general, Kinshasa is a capital city with large population immigrated from all over the country. No specific group, therefore, is identified as indigenous or minority with obvious social disadvantage.</li> </ul>
16	Local economy such as employment and livelihood	C (A- or B-)	B+	<ul style="list-style-type: none"> <li>– Since the width of the road expansion is not decided yet, and the character of businesses to be affected is not surveyed yet, the significance of impact in the construction phase is unknown.</li> <li>– In case the project is to demolish most of the road-side shops, business owners, workers, and customers will be negatively affected all along the University Avenue during the construction phase.</li> <li>– Once the road is widened and road-side businesses resume operation, businesses, workers, and customers will benefit from the project with better transportation access.</li> </ul>
17	Land use and local resource use	B-	D	<ul style="list-style-type: none"> <li>– Those who cultivate the unused road space may need to stop the activities and may lose income or harvest permanently starting from the construction phase.</li> <li>– Those who engage in informal business on the unused road space will need to move out work areas or stop operation during the construction phase. Such temporal or permanent ban of business may affect negatively on the household income of the poor group.</li> <li>– The area along the University Avenue is already urban. No significant change of land use will be generated in the operation phase.</li> </ul>

No	Identification of impact sources	Evaluation during the construction phase	Evaluation during the operational phase	Reasons for Evaluation
18	Water use	B-	D	<ul style="list-style-type: none"> <li>– The project will require relocation of water pipes. If coordination with REGIDESO is not well implemented, households may suffer from unavailability of water during the construction works.</li> <li>– No negative impacts are expected in the Operation Phase.</li> </ul>
19	Traffic facilities, public facilities, infrastructures, and their services	B-	B+	<ul style="list-style-type: none"> <li>– Facilities along the target road include: Schools, hospitals and maternity wards, churches, universities, funeral homes, markets, neighbourhoods offices, police offices, community halls, buildings with apartments for rent, Catholic nuns' convent and a bookshop, waste collection points, bus bays, gas stations, electric lines (overhead, underground, high voltage lines and towers), underground water pipes .</li> <li>– Although the width of the road expansion is not decided yet, above listed facilities may be physically affected by the construction works.</li> <li>– During the construction phase, part of the road may be temporally closed. Such closure will cause traffic jam and difficult passenger movement.</li> <li>– In the operation phase, those roadside facilities will benefit from smooth and easy access with improved road.</li> </ul>
20	Social institutions such as social infrastructure, social capital, and local decision - making institutions	D	D	<ul style="list-style-type: none"> <li>– Since the Project is an improvement of the existing road, no change or impacts are expected on existing social institutions.</li> </ul>
21	Uneven distribution of benefits and damages	D	D	<ul style="list-style-type: none"> <li>– The improvement of University Avenue will benefit all along the road by providing secured all-year road access.</li> </ul>
22	Local conflict of interests	D	D	<ul style="list-style-type: none"> <li>– Since the improvement of University Avenue will benefit all along the road by providing secured all-year road access, no local conflict of interests is expected.</li> </ul>

No	Identification of impact sources	Evaluation during the construction phase	Evaluation during the operational phase	Reasons for Evaluation
23	Cultural Heritage	B-	D	<ul style="list-style-type: none"> <li>– Cultural heritage refers to sites of cultural, historical or archaeological importance that may be affected by the Project. Although the width of the road is not decided yet, some of those sites may be affected.</li> <li>– In the operation phase, no additional negative impacts will be generated.</li> </ul>
24	Landscape	B-	D	<ul style="list-style-type: none"> <li>– The Project will modify the landscape in relation to the works and the widening of the road right-of-way.</li> <li>– For example, in PK 2+250 to PK 2+500 includes green spaces dominated by approximately 15m (45 feet) of acacia trees to the right of the road that are likely to be affected if the road right-of-way is widened.</li> <li>– In the operation phase, no additional negative impacts will be generated.</li> </ul>
25	Gender	B-	B+	<ul style="list-style-type: none"> <li>– In case households may suffer from unavailability of water during the construction works, it may be mainly female members who will be responsible for fetching drinking and cooking water.</li> <li>– Those who cultivate the unused road space may be dominantly female and may lose income or harvest permanently starting from the construction phase.</li> <li>– The bulk of formal and informal business activities are carried out by women.</li> <li>– In the operation phase, women will benefit from smooth and easy access to markets, hospitals and other social facilities with improved road.</li> </ul>
26	Children’s rights	B-	B+	<ul style="list-style-type: none"> <li>– Partial, temporal closure of road may negatively affect pupils and students with increased difficulty in commuting to schools and lowered road safety during the construction phase.</li> <li>– There is the possibility that under-aged children may be hired for construction works.</li> <li>– In the operation phase, children will benefit from smooth and easy access to schools, hospitals and other social facilities with improved road.</li> </ul>

No	Identification of impact sources	Evaluation during the construction phase	Evaluation during the operational phase	Reasons for Evaluation
27	Transmittable diseases including HIV/AIDS	B-	D	<ul style="list-style-type: none"> <li>– Malaria and other diseases transmitted by mosquitoes may occur from stagnant water in work areas.</li> <li>– Migrant labourers including construction workers are risk population of HIV/AIDS in many countries. If migrant labourers are hired for the project, the local risk of HIV/AIDS may become higher.</li> <li>– No additional negative impacts are expected in the operation phase of the 9km road improvement, since the project is a city-scale project and will not invite regional or national scale of population movement.</li> </ul>
28	Work safety, work environment	B-	B-	<ul style="list-style-type: none"> <li>– Workers may be subject to the risk of work-related accidents and injuries during the construction works.</li> <li>– In the operation phase, safety measures for road and drainage maintenance crew will be necessary to avoid accidents during their work.</li> </ul>
29	Accident	B-	B+	<ul style="list-style-type: none"> <li>– General public may be subject to increased risk of traffic jams at the work areas, increased risk of on-site accidents (i.e. dropping into an uncovered hole), and risk of accidents due to project-related transportation vehicles may be observed in the construction phase.</li> <li>– In the operation phase, positive impacts will be generated for general public with secured sidewalks and better all-year condition of the road.</li> </ul>
30	Climate change, transboundary impacts	B-	B+	<ul style="list-style-type: none"> <li>– Emission of greenhouse gases from construction machineries and transport vehicles will occur during the construction phase.</li> <li>– In the operation phase, smoother traffic movement will lead to lower consumption of fuel, and lower emission of greenhouse gas.</li> </ul>

Note:

A+/- A remarkably positive / serious negative impact is predicted

B+/- A positive / negative impact is expected to some extent

C The extent of the impact is unknown. (Further study is required.)

D The impact is very low or zero and no further survey is required

Source: The Study Team

## **7.2.7 Avoidance and Minimization of Negative Impacts**

### **(1) Planning Phase**

The measures listed below will be necessary to avoid or minimize the negative impacts in the Planning Phase.

- Comprehensive survey and adequate plan for compensation and assistance for those losing their assets and for those relocating must be implemented well in advance. Especially, sufficient information must be given to stakeholders to avoid unnecessary anxiety and opposition among the local communities.
- As long as it's feasible in view of the traffic capacity predicted in 2030 and 2040, it is necessary to minimize the ROW throughout the target section and to avoid affecting important buildings and facilities located at certain places on the target section.
- Adequate sidewalks, crosswalks and street lights must be provided for the safety of pedestrians.
- Adequate bus bays and space for taxis must be provided at suitable locations for smoother traffic flow.
- Utility managers must be well coordinated, so that there will be no gap or delay of public services in the Construction Phase.

### **(2) Construction Phase**

The measures listed below will be necessary to avoid or minimize the negative impacts in the Construction Phase.

- Transportation vehicles, construction machineries and electrical generators must be well maintained to minimize air and noise pollutions.
- Oils and chemicals must be stored indoor or on concrete floor to prevent soil and water pollution.
- The road is desirably kept open during the Construction Phase to allow through traffic to remain on artery road.
- Police and Commune Chiefs must be updated well about the work schedule to minimize social impact during the Construction Phase. Schools, churches, hospitals and other facilities must also be informed about the work schedule of the section in front of their lot so that impacts from traffic jam or partial/temporal road closure can be minimized.
- Utility managers must be well updated, so that there will be no gap or delay of providing public services in the Construction Phase.

### **(3) Operation Phase**

The measures listed below will be necessary to avoid or minimize the negative impacts in the

Operation Phase.

- Since the road will be significantly widened, police may need to be deployed and Commune Offices may need to be consulted to secure the safety of pedestrian crossing.
- The road surface must be maintained well, so that air and noise pollution will be minimized.

## 7.2.8 Proposed TOR for EIA Study

### (1) Composition of the EIA Study Team

Article 21 of the EIA Decree (Decree No. 14/019 of 02 August 2014 laying down the operating rules for the procedural mechanisms for the protection of the environment, *Décret n° 14/019 du 02 août 2014 fixant les règles de fonctionnement des mécanismes procéduraux de la protection de l'environnement*) requires the promoter of the Project to recruit a national consulting firm approved by the Ministry of the Environment or an international one to carry out the environmental and social impact assessment. However, with equal jurisdiction, priority is given to national consulting firm.

The composition of the local experts required by ACE for the SEA phase of the Master Plan Project is shown in Table 7.2.9. The same type and number of local experts are expected to be required in the EIA study.

**Table 7.2.9 The local Experts Required by ACE for the SEA Phase of the Master Plan Project**

Experts	Academic requirement	Professional requirement
An environmentalist	(Post-graduate diploma or Bachelor + 5 years of experience)	Head of mission with a professional experience of at least 10 years in the field of environmental and social assessment in Central Africa. It must have developed at least 2 ESAs on the environment of comparable importance;
An engineer in Urban Planning and Territorial Planning	(Bachelor + 5 years of experience) or equivalent	With at least 10 years' professional experience in developing urban development plans;
A civil engineer in construction	(Bachelor + 5 years of experience)	With a professional experience of at least 10 years in construction and rehabilitation of urban roads;
A topography geometric surveyor	(Bachelor + 5 years of experience)	With at least 5 years' professional experience in the construction and rehabilitation of urban roads;
A geographer	(Bachelor + 5 years of experience)	With professional experience in the Geographical Information System and Remote Sensing;
A sociologist		With at least 5 years of professional experience in environmental and social assessment in the DRC;
A lawyer	(Bachelor + 5 years of experience)	With at least 5 years professional experience in environmental and social assessment in the DRC;
An economist		With at least 5 years' professional experience in environmental and social assessment in the DRC;
An urban transport development expert		With 5 years' experience in transportation management and development in the city of Kinshasa.

Source: The Study Team

**(2) TOR of the EIA Study**

Table 7.2.10 shows the TOR for the EIA study the proposal of required field measurements.

**Table 7.2.10 TOR for Environmental and Social Impact Assessment**

No.	Impacts	Survey Items	Survey Method
1	Air Pollution	<ol style="list-style-type: none"> <li>1. Confirmation of ambient air standard</li> <li>2. Survey on current condition of air quality</li> <li>3. Assessment of expected impact of construction works and road operation</li> </ol>	<ol style="list-style-type: none"> <li>1. Consult with Authorities about applicable ambient air standards.</li> <li>2. Field measurement.</li> <li>3. Collection and confirmation of information on the project works to assess the impact on the existing conditions: types of activities, length of work, location/area, and machineries to be used.</li> </ol>
2	Water Pollution	<ol style="list-style-type: none"> <li>1. Confirmation of ambient and effluent water quality standard</li> <li>2. Survey on current condition of water quality</li> <li>3. Assessment of expected impact of construction works and road operation</li> </ol>	<ol style="list-style-type: none"> <li>1. Consult with Authorities about applicable ambient air standards.</li> <li>2. Field observation. (Field measurement if local laboratory has the capacity)</li> <li>3. Collection and confirmation of information on the project works to assess the impact on the existing conditions: types of activities, length of work, location/area, and machineries to be used.</li> </ol>
3	Soil pollution	<ol style="list-style-type: none"> <li>1. Understanding the construction plan</li> <li>2. Assessment of expected impact of construction works and road operation</li> </ol>	<ol style="list-style-type: none"> <li>1. Collection and confirmation of information on the project works: types of toxic oils and chemicals to be used, storage plan.</li> <li>2. Field observation of existing condition of oil and chemical spill from vehicles.</li> </ol>
4	Waste	<ol style="list-style-type: none"> <li>1. Understanding the construction plan</li> <li>2. Assessment of expected impact of construction works</li> </ol>	<ol style="list-style-type: none"> <li>1. Hearing survey of related organizations, site reconnaissance in the project area, inventory survey for the type of wastes expected to be generated in the Project, and information collection regarding permits and approvals necessary for waste disposal from construction site.</li> <li>2. Field observation of existing waste disposal site to confirm adequacy of the treatment of wastes</li> <li>3. Interview with the City government about improvement plan of waste management in near future.</li> </ol>
5	Noise and Vibration	<ol style="list-style-type: none"> <li>1. Confirmation of environmental standards</li> <li>2. Survey on current condition of noise and vibration</li> <li>3. Assessment of expected impact of construction works and road operation</li> </ol>	<ol style="list-style-type: none"> <li>1. Consult with Authorities about applicable ambient noise and vibration standards.</li> <li>2. Field measurement.</li> <li>3. Collection and confirmation of information on the project works to assess the impact on the existing conditions: types of activities, length of work, location/area, and machineries to be used.</li> </ol>
8	Pollution of bottom sediments	<ol style="list-style-type: none"> <li>1. Understanding the construction plan</li> <li>2. Assessment of expected impact of construction works and road operation</li> </ol>	<ol style="list-style-type: none"> <li>1. Collection and confirmation of information on the project works: types of toxic oils and chemicals to be used, storage plan.</li> <li>2. Field observation of existing condition of oil and chemical spill from vehicles.</li> </ol>
13	Involuntary Resettlement, Loss of Land	<ol style="list-style-type: none"> <li>1. Number and significance of the affected residents and businesses who are to be relocated because</li> </ol>	<ol style="list-style-type: none"> <li>1. Topographic survey and land registration survey to identify the necessary land for the Project and their owners.</li> </ol>

No.	Impacts	Survey Items	Survey Method
	and Asset, Business Relocation	of the Project 2. Policy framework of compensation, assistance, and process of land acquisition and resettlement	2. Asset survey to identify the public and private assets that will be lost or need to be relocated. 3. Market price survey to seize the necessary budget for compensation for land and assets. 4. Census survey to identify and count residents (PAPs), households (PAHs) and businesses to be affected, to identify individuals and households who belong to vulnerable groups, and to identify the significance of the impact on them. 5. Abbreviated census survey to identify non-resident (absentee) land owners to be affected and the significance of the impact on them. 6. Socio-economic survey (on minimum 20% of the PAHs) to understand the major characteristics of the PAHs and their living standards of pre-project condition. 7. Discussion and negotiation with CI and related authorities about the schedule, institutional coordination, and policy on compensation and assistances, including grievance redress mechanism. 8. Public consultation will be held for 2 times at each 5 communes which might be affected. The opinion raised will be reflected to the Policy Framework of compensation, assistance, and process of land acquisition and resettlement. 9. Planning of the resettlement housing, or identifying available housings for relocation
14	The Poor	1. Number and type of the people, and significance of the Project impact on them 2. Assistances to be provided to them	1. Identify the most recent and realistic poverty line and minimum wage. 2. Census survey to identify and count PAPs who are classified to belonging to the Poor. 3. Understanding the types and significance of the Project impact 4. Formulate the adequate size and types of compensation and assistances to be provided by the Project
15	Indigenous or minority groups	1. Number and type of the people, and significance of the Project impact on them 2. Assistances to be provided to them	1. Identify the potential group to be found in the Project area that may be categorized as indigenous or minority groups. 2. Census survey to identify and count PAPs who are classified to belonging to the indigenous or minority groups. 3. Understanding the types and significance of the Project impact. 4. Formulate the adequate size and types of compensation and assistances to be provided by the Project
16	Local Economy, Employment and Living, Livelihood	1. Number and type of the employment, commercial facilities and activities along the existing road that will be affected	1. Census survey to identify and count businesses to be affected, not including vendors, to identify the significance of the Project impact on them. 2. Formulate the adequate size and types of



No.	Impacts	Survey Items	Survey Method
		by the Project. 2. Significance of the impact 3. Assistances to be provided to them	compensation and assistances to be provided by the Project
17	Land use and local resource use	1. Number and type of the land use activities along the existing road that will be affected by the Project. 2. Significance of the impact 3. Assistances to be provided to them	1. Census survey to identify and count land-based activities such as farming and vending to be affected to identify the significance of the Project impact on them. 2. Identify means and willingness to avoid or minimize the Project impact, such as potential of voluntary change of vending locations. 3. Formulate the adequate size and types of consultation and assistances to be provided by the Project.
18	Water Use	1. Potential impact on water use 2. Means to avoid or minimize the impact of water use by the Project	1. Identify the number, type, and location of the water use facilities and activities to be affected by the Project. 2. Negotiate and coordinate with the utility managers to avoid or minimize the impact. 3. If the impact cannot be avoided, plan for the mitigation measures such as provision of alternative water sources. Negotiate with the stakeholders about the possibility of acceptance of the mitigation measures.
19	Existing Public Facilities, Road and Transportation Facilities, Social Infrastructure, Social Services	1. Size, types, duration, and significance of the impacts on the public facilities to be affected by the Project 2. Means to avoid or minimize the impact by the Project	1. Identify the location and type of the facilities to be affected by the Project. 3. Collection and confirmation of information on the project works to assess the impact: types of activities, length of work, location and area, machineries to be used, transportation routes used by heavy vehicles, etc. 3. Assess the possibility of occurrence of unavailability of services 4. If the impact cannot be avoided, plan for the mitigation measures such as relocation or set back within the remaining land parcel. Negotiate with the stakeholders about the possibility of acceptance of the mitigation measures.
23	Cultural Heritage	1. Identify the loss of cultural and heritage resources by the Project 2. Plan for mitigation measures for the loss	1. Identify the location and type of resources to be affected. 2. Negotiate if the impact can be avoided by road design. 3. If the impact cannot be avoided, plan for mitigation measures such as relocation or set back within the remaining land parcel. Negotiate with the stakeholders about the possibility of acceptance of the mitigation measures.
24	Landscape	1. Identify the loss of street trees and plan for new plantings	1. Identify the number and location of street trees to be lost 2. Where possible and appropriate, design new street trees
25	Gender	1. Negative impact on water use is to be minimized.	1. Confirm that negative impact on water use is planned to be minimized.

No.	Impacts	Survey Items	Survey Method
		2. Negative impact on land-based activities such as farming and vending is to be minimized.	2. Confirm that land-based activities such as farming and vending to be affected are properly counted and recorded, and adequate size and types of consultation and assistances are planned to be provided by the Project.
26	Children's Rights	<ol style="list-style-type: none"> <li>1. Impact on schools</li> <li>2. Potential for under-age employment at the construction sites</li> <li>3. Plan to avoid and minimize the negative impacts</li> </ol>	<ol style="list-style-type: none"> <li>1. Identify the location of schools to be affected.</li> <li>2. Estimate the significance of the impacts, such as possibility of occurrence of unavailability of social services.</li> <li>3. Plan to avoid and minimize the negative impacts including mitigation measures such as relocation within the remaining land parcel.</li> <li>4. Confirm that adequate road safety measures are designed in the area near to schools and other facilities frequented by children.</li> <li>5. Understand the legal work age and hiring customs in the Project Area.</li> <li>6. Plan measures to avoid under-age employment at construction sites.</li> </ol>
27	Transmittable diseases including HIV/AIDS	<ol style="list-style-type: none"> <li>1. Identify the vulnerable groups and main target diseases against transmittable diseases</li> <li>2. Plan to minimize the impact during the Construction Phase</li> </ol>	<ol style="list-style-type: none"> <li>1. Identify the vulnerable groups against HIV/AIDS in DRC.</li> <li>2. Identify the major transmittable diseases</li> <li>3. Plan to minimize the impact during the Construction Phase</li> </ol>
28	Work Environment, Occupational Safety and Health	<ol style="list-style-type: none"> <li>1. Study the standard measures taken in similar construction works in Kinshasa.</li> <li>2. Plan the measures to minimize potential occurrence of work accidents and health issues.</li> </ol>	<ol style="list-style-type: none"> <li>1. Field observation of the standard measures taken in similar construction works in Kinshasa.</li> <li>2. Collection and confirmation of information on the project works to assess the impact on the existing conditions: types of activities, length of work, location/area, and machineries to be used.</li> <li>3. Plan the measures to minimize potential occurrence of work accidents and health issues.</li> </ol>
29	Accidents, Crime	<ol style="list-style-type: none"> <li>1. Study the potential increase of traffic accidents during the Construction Phase.</li> <li>2. Plan the measures to minimize the impact</li> </ol>	<ol style="list-style-type: none"> <li>1. Understand the road design.</li> <li>2. Understand the construction plan including plan for detour and road closure.</li> <li>3. Plan the measures to minimize the impact for vehicles and pedestrians.</li> <li>4. Confirm that sufficient safety measures are designed to avoid and minimize road accidents in the Operation Phase.</li> </ol>
30	Climate change, transboundary impacts	<ol style="list-style-type: none"> <li>1. Identify the potential impact and measures to minimize the impact</li> </ol>	<ol style="list-style-type: none"> <li>1. Identify the sources of greenhouse gas emission from the construction works.</li> <li>2. Plan to minimize the emission.</li> </ol>

Source: The Study Team

### (3) TOR for Field Measurement

- 1) Air Quality: Table 7.2.11 shows desirable and acceptable TOR for air quality field measurement.

**Table 7.2.11 TOR for Air Quality Field Measurement**

<b>Number of measurement and timing</b>	<ul style="list-style-type: none"> <li>● Desirable: 2 measurements, one in dry winter (June to September), and one in wet summer (October to May)</li> <li>● If the Study does not cover those two seasons, 1 measurement in either one season may suffice.</li> </ul>
<b>Location</b>	<ul style="list-style-type: none"> <li>● Location(s) must be chosen based on following conditions:                             <ul style="list-style-type: none"> <li>➢ At place(s) where air pollution must be avoided most seriously: i.e. hospital with in-house patients, schools.</li> <li>➢ At place(s) where condition of air pollution will change most significantly in the Operation Phase: i.e. new cross section, new bus terminal.</li> </ul> </li> <li>● To compare the air quality in the Operation Phase, the measurement must be done on the boundary of planned ROW</li> </ul>
<b>Number of points</b>	<ul style="list-style-type: none"> <li>● Desirable: 2 points at 1 location, on both side of the road.</li> <li>● If simultaneous measurement on both sides of the road is difficult, one point at 1 location may suffice.</li> </ul>
<b>Duration</b>	<ul style="list-style-type: none"> <li>● Desirable: Continuously for 24 hours, 7 days</li> <li>● If continuous measurement is difficult because of security or technical reasons, night hour measurement can be omitted.</li> </ul>
<b>Items</b>	<ul style="list-style-type: none"> <li>● Desirable: NO<sub>x</sub> (NO, NO<sub>2</sub>), CO, PM<sub>10</sub>, PM<sub>2.5</sub>, traffic count, weather, air temperature, moisture, wind direction, wind velocity.</li> <li>● Traffic count may be omitted when there are timing and budgetary limitations.</li> </ul>

Source: The Study Team

2) Noise and Vibration: Table 7.2.12 shows desirable and acceptable TOR for noise and vibration field measurement.

**Table 7.2.12 TOR for Noise and Vibration Field Measurement**

<b>Location</b>	<ul style="list-style-type: none"> <li>● Location(s) must be chosen based on following conditions:                             <ul style="list-style-type: none"> <li>➢ At place(s) where noise pollution must be avoided most seriously: i.e. hospital with in-house patients, schools.</li> <li>➢ At place(s) where condition of traffic noise is typical of the section(s) in terms of roadside land use, building size and density.</li> </ul> </li> <li>● To compare the noise in the Operation Phase, the measurement must be done on the boundary of planned ROW</li> </ul>
<b>Number of points</b>	<ul style="list-style-type: none"> <li>● 1 point at 1 location, on one side of the road</li> </ul>
<b>Timing and Duration</b>	<ul style="list-style-type: none"> <li>● Average work day</li> <li>● 1 hour during average day time, 1 hour during average night time</li> <li>● If night time measurement is difficult because of security or technical reasons, night time measurement can be omitted.</li> </ul>
<b>Items</b>	<ul style="list-style-type: none"> <li>● Desirable: Noise (Leq: equivalent sound level), Vibration (L10: statistical vibration level just exceeded for 10% of the time); traffic count; weather, air temperature, moisture, wind direction, wind velocity</li> <li>● Traffic count may be omitted when there are timing and budgetary limitations.</li> </ul>

Source: The Study Team

### 7.2.9 Schedule for EIA Study

Table 7.2.13 shows the process of EIA study review and issuance of Environmental Certification described in the EIA Decree. No specific time requirement is noted except the three months required for ACE review after the submission of EIA (ESIA) report.

**Table 7.2.13 Process of EIA (ESIA) Study**

1	The proponent shall submit a request for the carrying out of the environmental and social impact assessment to ACE.
2	Upon review of the application, ACE determines whether or not the project is subject to environmental and social impact assessment and informs the proponent.
3	ACE issues official TOR to the proponent.
4	The proponent starts the survey based on the official TOR, and shall submit the EIA (ESIA) report to ACE.
5	Within 3 months after the submission of the EIA (ESIA) report, ACE will notify the promoter of: <ul style="list-style-type: none"> <li>● Either the admissibility, or not, of the study, in which case it issues the Environmental Certificate;</li> <li>● Either the observations to be incorporated, or not, to make the study admissible by amendment;</li> <li>● Either its rejection, or not, in which case the promoter must resume its study.</li> </ul>
6	ACE issues Environmental Certificate.
7	The authorization of the realization of project is sanctioned by the issuance of the Environmental Certificate by ACE.

Source: The Study Team

### 7.2.10 Necessary Budget for EIA Study

A preliminary budget was estimated by the local consultant that assisted the IEE study. Table 7.2.14 shows the breakdown of the estimated costs of the EIA Study.

**Table 7.2.14 Preliminary Cost Estimation of EIA (ESIA) Study**

<b>A. Remuneration</b>						
No	Post		Rate of Payment/ Person (USD / Day)	Time assigned in person (day)	Total Daily Expense (USD)	Total (USD)
<b>Fees</b>						
C-1	Environmental Expert (Team Leader)	Office	300	9	2,700	6,000
		On site	300	11	3,300	
C-2	Lawyer	Office	250	13	3,250	4,250
		On site	200	5	1,000	
C-3	Economist	Office	200	13	2,600	3,600
		On site	200	5	1,000	
C-4	Sociologist	Office	200	7	1,400	3,600
		On site	200	11	2,200	

<b>A. Remuneration</b>						
No	Post		Rate of Payment/ Person (USD / Day)	Time assigned in person (day)	Total Daily Expense (USD)	Total (USD)
C-5	GIS Expert	Office	200	9	1,800	3,000
		On site	200	6	1,200	
C-6	Topography Surveyor	Office	200	9	1,800	2,800
		On site	200	5	1,000	
C-7	Civil Engineer	Office	250	8	2,000	3,600
		On site	200	8	1,600	
C-8	Urban Planner	Office	250	5	1,250	3,250
		On site	200	10	2,000	
C-9	Urban Transport Expert	Office	250	8	2,000	4,000
		On site	200	10	2,000	
<b>A. Sub-total (USD)</b>						<b>34,100</b>
<b>B. Refundable expenses (Technical service charge) paid by:</b>						
N-1	Environmental Expert (Team Leader)		50	9	450	450
N-2	Lawyer		50	13	650	650
N-3	Economist		50	13	650	650
N-4	Sociologist		50	11	550	550
N-5	GIS Expert		50	9	450	450
N-6	Topography Surveyor		50	9	450	450
N-7	Civil Engineer		50	5	250	250
N-8	Urban Planner		50	5	250	250
N-9	Urban Transport Expert		50	8	400	400
<b>B. Sub-total (USD)</b>						<b>4,100</b>
<b>Remuneration Sub-total (A+B) (USD)</b>						<b>38,200</b>

<b>C. Daily Allowance of Key Persons and Local Investigators (Communication and Local Transport)</b>						
No	Type of Reimbursable Expenses	Volume	Per diem (USD)	Number of days	Total Daily Expense (USD)	Total (USD)
Environmental Expert	Assistant	6	120	10	720	7,200
	Transport	6	10	10	60	600
	Materials					500
	Communication					600

<b>C. Daily Allowance of Key Persons and Local Investigators (Communication and Local Transport)</b>						
No	Type of Reimbursable Expenses	Volume	Per diem (USD)	Number of days	Total Daily Expense (USD)	Total (USD)
	<b>Sub-total (USD)</b>					<b>8,300</b>
Lawyer	Assistant	5	120	10	600	6,000
	Materials					200
	Transport	5	10	10	50	500
	Communication					500
	<b>Sub-total (USD)</b>					<b>7,200</b>
Economist	Assistant	6	120	10	720	7,200
	Communication					600
	Transport	6	10	10	60	600
	Supplies		10	10		100
	<b>Sub-total (USD)</b>					<b>8,500</b>
Sociologist	Assistant	6	120	10	720	7,200
	Supplies					200
	Transport	6	10	10	60	600
	Communication					600
	Meeting room rental	5	200	2	1,000	2,000
	Transportation allowance of sensitized stakeholders	50	10	10	500	5,000
	<b>Sub-total (USD)</b>					<b>15,600</b>
Civil ENGINEER	Assistant	2	120	10	240	2,400
	Communication					200
	Transport	2	10	10	20	200
	Materials	5			420	420
	<b>Sub-total (USD)</b>					<b>3,220</b>
Urban Transport Expert	Assistant	3	120	10	360	3,600
	Transport	3	10	10	30	300
	Communication					300
	<b>Sub-total (USD)</b>					<b>4,200</b>
Topography Surveyor	Assistant	2	120	10	240	2,400
	Communication					200
	Transport	2	10	10	20	200
	Materials				420	420
	<b>Sub-total (USD)</b>					<b>3,220</b>

<b>C. Daily Allowance of Key Persons and Local Investigators (Communication and Local Transport)</b>						
No	Type of Reimbursable Expenses	Volume	Per diem (USD)	Number of days	Total Daily Expense (USD)	Total (USD)
Urban Planner	Assistant	2	120	10	240	2,400
	Communication					200
	Transport	2	10	10	20	200
	<b>Sub-total (USD)</b>					<b>2,800</b>
GIS Expert	Assistant	2	120	10	240	2,400
	Communication					200
	Transport	2	10	10	20	200
	Materials				420	420
	<b>Sub-total (USD)</b>					<b>3,220</b>
<b>C: Sub-total (USD)</b>						<b>56,260</b>

<b>D. Production of reports and administrative burdens</b>	
Reproduction fees for questionnaires, manuals and reports	850
Data entry operator	920
<b>D: Sub-total (USD)</b>	<b>1,770</b>

<b>E.</b>	<b>Direct Project cost total =A+B+C+D</b>		<b>96,230</b>
<b>F.</b>	<b>Head office expenses (8% of E)</b>		<b>7,698</b>
<b>G</b>	<b>Project cost total (=E+F)</b>		<b>103,928</b>
<b>H.</b>	<b>Value Added Tax (16%)</b>		<b>16,629</b>
<b>Grand Total</b>			<b>120,557</b>

Source: The Study Team

## 7.3 Relocation, Resettlement and Rehabilitations

### 7.3.1 Legal Framework for Relocation, Resettlement and Rehabilitations

#### (1) DRC

##### 1) The Different Categories of Lands

Since the abolition of privately owned land (Article 9 of the Transitional Constitution and Article 53 of the Land Law), ownership of the soil and subsoil belongs solely to the Congolese State. The Land Law, the Law No. 73-021 of 20 July 1973, was amended and supplemented by Act No. 80-008 of 18 July 1980. Article 54 of the Land Law states that the State's land assets including public and private domains. Essentially the Land Law distinguishes between following 4 types of lands. The relationship of the 4 land types is shown in Figure 7.3.1.

1. Land of the public domain of the State

These are lands that are assigned to a public use or service and are therefore non-transferable until they are regularly abandoned (Article 55). The same Land Law adds to these lands the bed of any lake and that of any navigable watercourse, whether buoyant or not (Article 16).

2. Land of the private domain of the State

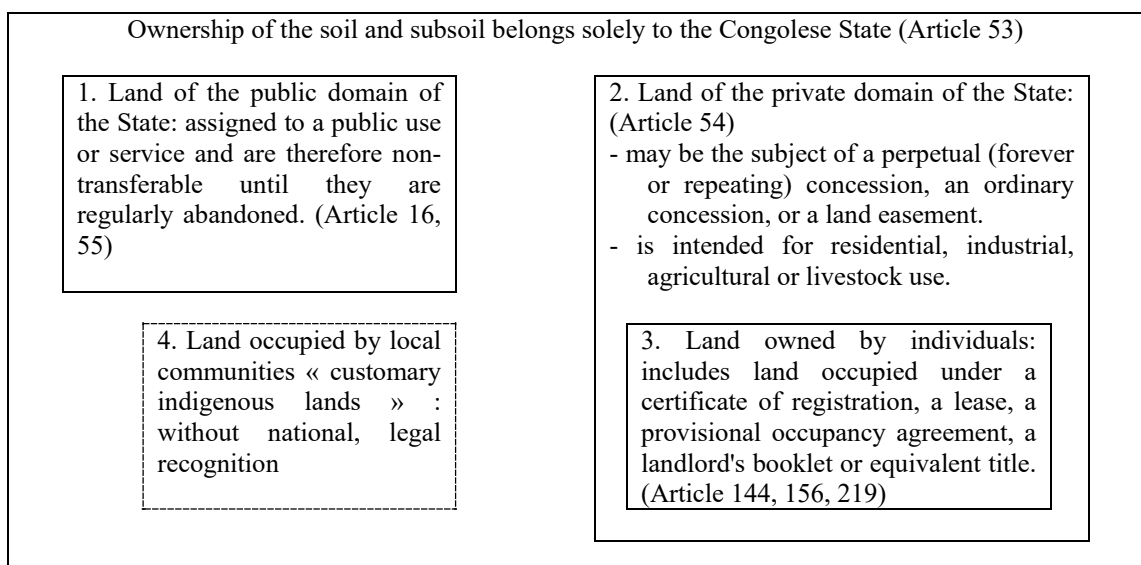
These are all other lands other than those reserved for public use. This land may be the subject of a perpetual concession, an ordinary concession or a land easement. This land is intended for residential, industrial, agricultural or livestock uses.

3. Land owned by individuals

This sub-category includes land occupied under a certificate of registration (Article 219), a lease (Article. 144), a provisional occupancy agreement (Article 156), a landlord's booklet or equivalent title.

4. Land occupied by local communities « customary indigenous lands »

These are collective rights of enjoyment, since all land has been State property since the 1973 reform. There is no national legislation that recognizes or grants indigenous peoples a special status or special rights.



Source: The Study Team

**Figure 7.3.1 Four Categories of Lands in DRC**

2) The Land Acquisition for Public Purpose in DRC

The Law 77-001 of 22 February 1977 on Expropriation for Reasons of Public Utility defines the target and process of resettlement for public purposes in DRC. Provisional translation is shown in Table 7.3.1.



Although the Law has various missing points when compared with the JICA Guidelines and WB Operation Policy, the project-specific commission described below is able to act based on the requirements of international donors to bridge the shortcomings.

**Table 7.3.1 Provisional Translation of the Law 77-001 of 22 February 1977 on Expropriation for Reasons of Public Utility**

Article 1	Categories of target property	Following categories of target property are liable to expropriation for reasons of public utility: (A) real property; (B) real property rights other than a mining permit and a mining concession that are governed by special legislation; (C) debt securities for the acquisition or enjoyment of immovable property; (D) the rights of enjoyment of local communities over public lands. Rights other than immovable property are expropriated jointly with the immovables they affect. If they affect State buildings, they form the direct object of the procedure.
Article 2	Categories of public utility	The public utility is capable of extending to the most diverse needs of the social community, in particular in the fields of economy, security, military defence, public services, hygiene, aesthetics, the preservation of the natural beauty and monuments, tourism, plantations and livestock, roads and buildings including its structures. It assumes that the property taken over by the State will have a useful purpose for all, or a particular community.
Article 3	Target for expropriation: properties, goods, and zones	Expropriation for reasons of public utility may be ordered either for one or more individually designated properties or for all the goods included in a given perimeter. In the second hypothesis, public utility is assessed as to the totality of the goods included in the perimeter.
Article 4		In the case of execution of a set of public works, the President of the Republic may order the expropriation by zones of goods intended for the performance of such works or to be put into operation Sale or granted to the State.
Article 5	Origin of the action	The expropriation proceedings originate in a decision pronouncing the public utility of the works and ordering the expropriation.
Article 6	Information to be included in the decision	This decision is taken: (A) for ordinary expropriation or by perimeter, by a decree signed by the Commissioner of State in charge of land affairs; (B) for an expropriation by zones, by presidential ordinance. The decision must mention the full identity of the persons concerned and be based on a plan of the property to be expropriated and, in the event of expropriation by zones, a plan showing the work to be carried out and the property to be offered for sale or to be granted. It shall also fix the time-limit for removal from the date of transfer.
Article 7	Publishing the decision	The decision shall be published in the Official Gazette and brought to the attention of the persons exposed to the expropriation by registered letter with acknowledgment of receipt or delivered personally by a courier against a dated and signed receipt.
Article 8	In the case of collective rights	In the case of collective rights of enjoyment, the population shall also be informed orally by means of a communication addressed to the qualified representatives of the local communities concerned by the zone commissioner or his delegate. The latter shall draw up a report which shall be transmitted to the

		<p>authority which took the decision to expropriate, together with a copy of the warnings and the receipt provided for in the preceding article.</p> <p>When this decision has been taken by presidential order, the documents referred to in the preceding paragraph shall be transmitted to the Commissioner of State responsible for land affairs.</p>
Article 9	When a property owner cannot be found	<p>If an interested person cannot be affected by one of the procedural acts, the administration shall notify the public prosecutor to the court of the district which shall urgently take the measures it considers useful for the defence of the interests in question.</p> <p>He can continue the searches undertaken by the administration: if they fail or prove useless, the public prosecutor requests that the court appoints an administrator of the property to be expropriated.</p> <p>Its rights and duties are limited to the representation of the expropriated party in the expropriation proceedings and the judicial determination of the compensation. Articles 71 and 72 of Book 1 of the Civil Code relating to persons apply to him.</p> <p>The indemnities shall be deposited in the name of the expropriated person at the Zaire Savings Bank, less the fees due to the administration and taxed by the court.</p>
Article 10	Rental and other rights	<p>Where there are rental rights or other rights not included in the registration certificate in respect of the immovables included in the plan referred to in Article 6, the owner or concessionaire shall notify the holders of their interests without delay; failing which he shall remain liable to them for the indemnities which they might have claimed.</p>
Article 11	Claims by the owner	<p>Claims, observations and agreements to which the expropriation decision gives rise, as well as the duly justified prices, indemnities or compensations which the persons concerned must claim must be brought to the attention of the authority which took the decision of expropriation, within one month of the date of the advice of receipt or the receipt provided for in the preceding Articles 7 and 8.</p> <p>This period may be extended by the authority which decided the expropriation.</p> <p>When this decision has been taken by presidential order, the matters referred to in the first paragraph of this article shall be addressed to the Commissioner of State responsible for land affairs.</p>
Article 12	State proposal for compensation	<p>On expiry of the time limit, proposals for compensation shall be made to the persons concerned.</p> <p>These proposals are based on an expert report drawn up and signed by two land surveyors who are real estate experts in the cadastre. If necessary, an agronomist or other specialist is added to the property depending on the nature of the property to be expropriated.</p> <p>In the case of expropriation of collective or individual rights of enjoyment by local people on State lands, the expropriating party shall rely on a prescribed inquiry in accordance with Provisions of Articles 193 to 203 of Law 73-021 of 20 July 1973.</p> <p>Expertise and inquiry may be made prior to the commencement of the expropriation proceedings.</p>
Article 13	Settlement at court	<p>In the absence of an amicable agreement, the parties to expropriate shall be summoned at the request of the expropriating party to have the courts verify the regularity of the administrative procedure and settle the compensation.</p>
Article 14	Appointment of experts and hearing by the	<p>Within 15 days of the summons, the court hears the parties and within eight days of that date decides on the due process and appoints 3 experts on the selection of which the parties have agreed. In the absence of</p>

	Court	agreement, he shall appoint them ex officio.
Article 15		The tribunal shall fix the period within which the appointed experts shall have submitted their report. This period may not exceed 60 days, except in exceptional circumstances, in which case it may be extended by 30 days. The experts may, at the office of the custodian of real estate securities, be informed by the custodian of all the information necessary for the accomplishment of their mission. They shall file at the Registry of the Court, within the time-limit set, a joint report in as many copies as there are parties to the case.
Article 16		Within eight days of the filing of this report, the chairman of the court shall call the parties to a fixed hearing in accordance with the time limits for postponement of the ordinary law. A copy of this report is attached to the convening notice.
Article 17		At the hearing so fixed, the court shall hear the parties and possibly the experts. No later than the month in which the hearing is held, it shall decide on the amount of the compensation and the costs and if the expropriated person seizes it, for the duration of the period of eviction. The judgment is enforceable by provision, notwithstanding any appeal and without security.
Article 18	Value and timing of compensation	Without prejudice to the provisions of Articles II and III of the transitional provisions of the Constitution and Articles 102, 103, 120 and 131 of Law 73-021 of 20 July 1973, the compensation due to the expropriated party must be based on the value of the property at the date of the ruling on the due process. It must be paid before the registration of the transfer and at the latest within 4 months of the judgment fixing the allowances. After this period, the expropriated party may sue the expropriating party for cancellation of the expropriation, without prejudice to any damages, if any.
Article 19	Registration fee	Registration of a transfer affected in execution of an expropriation order shall be free of charge.
Article 20	Mortgages	The mortgages on the expropriated property shall be deducted from the price. In this case, the procedure provided for in Article 293 of Law 73-021 of 20 July 1973 is carried out.
Article 21	If not used for original purpose	If property expropriated for public purposes does not receive that destination, a notice published in the Official Gazette indicates that the administration is prepared to put them on sale or to grant them to third parties. The notice shall indicate the status of the property and the names of the former owners or concessionaires. Within three months of this publication, the former owners or concessionaires or their successors who wish to reacquire the said goods are obliged to declare it on pain of forfeiture. If the administration fails to publish such notice, the former owners or concessionaires or their successors in title may request the delivery of the said goods and this remission shall be ordered in court on the declaration of the administration that they are no longer intended to serve the work for which they had been acquired. The price of the goods to be retroceded will be fixed by the court if it is better for the owner to return the amount of the indemnity he has received. The judicial determination of the price may in no case exceed the

		amount of the indemnity, increased by six per cent per year or fraction of a year which has elapsed since the transfer of the property.
Article 22		Article 21 shall not apply to property expropriated by virtue of Article 4. Such property shall be offered to the public on the conditions laid down by decree of the regional commissioner or, in Kinshasa, by the Commissioner of State having the land affairs in his attributions.
Article 23		There shall be exempted from the fixed and proportional rights of registration in land matters, transfers made under Article 21 on behalf of the former owners or concessionaires or their successors.
Article 24	Repeal	The administrative and judicial formalities prescribed by this law are prescribed on pain of nullity.
Article 25		The Decree of July 14, 1956 on expropriation for reasons of public utility is repealed.

Source: The Study Team

3) The Decree on Establishing the Evaluation Commission for Resettlement Regarding the Congo-Japon Boulevard Project

The Decree, No. CAB / MIN-ITPR / 003 / RM / CM / 2012 of 27 April 2012 of the Minister of Infrastructure, Public Works and Reconstruction, established the commission for the evaluation of concessions and buildings in the land required by the Project to improve Congo-Japon Boulevard. Provisional translation of the Decree is shown in Table 7.3.2. A similar decree will be necessary to establish another commission for the improvement of University Avenue.

By establishing a project-specific evaluation commission, including the donor-side consultant as observer, the DRC Government is able to adopt donor-specific guidelines and requirements related to compensation and assistances to the PAPs (Project Affected Persons).

**Table 7.3.2 The Decree on Establishing the Evaluation Commission for Resettlement Regarding the Congo-Japon Boulevard Project**

Article 1	An Evaluation Committee is set up to identify and evaluate private and public concessions and buildings on Congo-Japon Boulevard.
Article 2	The Evaluation Commission shall carry out the following specific tasks: <ul style="list-style-type: none"> <li>- List the concessions and buildings to be expropriated including those targeted by the detailed studies of the consultant INGEROSEC</li> <li>- Identify the owners of said concessions and buildings</li> <li>- Proceed to the verification of the titles of ownership and the certificates of registrations</li> <li>- Proceed to the evaluation of the said concessions and buildings</li> </ul>
Article 3	The Commission is composed of 15 members representing the following departments and services: <ul style="list-style-type: none"> <li>- Ministry of Infrastructure, Public Works and Reconstruction: 1 delegate</li> <li>- Ministry of Finance: 1 delegate</li> <li>- Ministry of Land Affairs: 2 delegates</li> <li>- Ministry of Urban Planning and Housing: 1 delegate</li> <li>- Kinshasa City Hall: 1 delegate</li> <li>- Infrastructure Cell: 2 delegates</li> <li>- Office of Roads and Drainage: 2 delegates</li> <li>- Technical Office of Contrale: 1 delegate</li> <li>- Representatives of Communes (Gombe, Limete, Kingabwa and Matete): 4 delegates</li> </ul> <p>The Company KITANO CORPORATION and the Supervision Mission INGEROSEC participate in the work as an observer</p> <p>This Commission will be presided over by the delegate of the Ministry of Infrastructure, Public Works and Reconstruction;</p> <p>It will adopt a code of good conduct for its members;</p> <p>It will designate 9 permanent members to report to the plenary which will meet one (1) time a week at the Headquarters of the Infrastructure Unit.</p>
Article 4	The Commission shall have a period of 1 month from the date of signature of this Decree to carry out its mission; and it is automatically dissolved when the final report of the works is submitted to the Ministry of Infrastructure, Public Works and Reconstruction.
Article 5	The Secretary General for Infrastructures and Public Works will incur the expenses relating to the operation of this commission which is at the expense of the Public Treasury.
Article 6	The Secretary General for Public Infrastructures and Tribunals and the Coordinator of the Infrastructure Unit are each responsible for the execution of this Order, which comes into force on the date of its signature.

Source: The Study Team

## (2) Gaps between JICA Guideline and Laws in DRC

Gaps between JICA Guidelines and laws in DRC is summarized in Table 7.3.3.

**Table 7.3.3 Gaps between JICA Guideline and Laws in DRC**

	<b>JICA Guidelines, WB OPs</b>	<b>Law 77-001 of 22 February 1977 on Expropriation for Reasons of Public Utility</b>	<b>Gap</b>	<b>Bridging Measures</b>
1	Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives.	Duty of effort for avoidance is not included in the Law.	Duty of effort for avoidance is not included in the Law.	During the Pre-F/S, the JICA Study Team explained the importance of avoiding resettlement to CI. The CI agreed and discussed the ROW alternatives with the JICA Study Team, looking for the best balance of traffic capacity and avoidance of resettlement. The same communal effort will be used in the following F/S.
2	When population displacement is unavoidable, effective measures to minimize impact and to compensate for losses should be taken.	Duty of effort for minimization is not included in the Law. Compensation for losses will be firstly claimed by the owner (Article 11). If the claim is not made, public proposal shall be made (Article 12).	Duty of effort for minimization is not included in the Law.	During the Pre-F/S, the JICA Study Team explained the importance of minimizing resettlement to CI. The CI agreed and discussed the ROW alternatives with the JICA Study Team, looking for the best balance of traffic capacity and minimizing the resettlement. The same communal effort will be used in the following F/S.
3	People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels.	Duty of effort for sufficiently compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels, is not included in the Law.	Duty of effort for sufficiently compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels, is not included in the Law.	During the Pre-F/S, the JICA Study Team explained the definition of sufficient compensation and assistances in regard to the livelihood rehabilitation after the resettlement to CI, OVD, and OR. All the institutions agreed on the principle, said that they have implemented the same policy in previous WB- assisted projects, and promised that the policy of the JICA Guidelines will be reflected in the decision of compensation and assistances for the University Avenue Project.
4	Compensation must be based on the full replacement cost as much as possible.	The compensation must be based on the value of the property at the date of the ruling on the due process (Article 18).  The State proposal for compensation will be based on	The compensation may be based on market value, not exactly the replacement cost.	The policy of the JICA Guidelines and the definition of the replacement cost must be explained to IC in the following F/S.  The JICA policy must be reflected in the decision of compensation and assistances

	JICA Guidelines, WB OPs	Law 77-001 of 22 February 1977 on Expropriation for Reasons of Public Utility	Gap	Bridging Measures
		<p>an expert report drawn up by two land surveyors, and if necessary, an agronomist or other specialist is added depending on the nature of the property (Article 12).</p> <p>Registration of a transfer shall be free of charge (Article 19).</p>		for the University Avenue Project.
5	Compensation and other kinds of assistance must be provided prior to displacement.	Compensation must be paid before the registration of the transfer, and at the latest within 4 months of the judgement fixing the allowances (Article 18).	The timing of payment is not defined by the timing of displacement.	The policy of the JICA Guidelines on the timing of provisions must be explained to IC in the following F/S. The JICA policy must be reflected in the decision of compensation and assistances for the University Avenue Project.
6	For projects that entail large- scale involuntary resettlement, resettlement action plans must be prepared and made available to the public.	Preparation of RAP is not required for any scale of the project.	Preparation of RAP is not required for any scale of the project.	During the Pre-F/S, the JICA Study Team explained the necessity of RAP to CI, OVD, and OR. All the institutions agreed the principle, said that they have implemented the same policy in previous WB- assisted projects, and promised that the policy of the JICA Guidelines will be followed in the future phase of the University Avenue Project.
7	In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance.	<p>The decision of expropriation will be published in the Official Gazette and brought to the attention of the affected or interested persons (Article 7).</p> <p>The representatives from affected communes are made as member of the Special Commission in the Congo-Japon Boulevard Project (Decree Article 3).</p>	Consultation with PAPs and communities is not required for any scale of the project.	The policy of the JICA Guidelines on the timing of provisions must be explained to IC in the following F/S. The most suitable design of public consultation needs to be discussed and implemented in the following F/S, considering the unstable security condition of the Project Area.
8	When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people.	Consultation with PAPs and communities is not required for any scale of the project.	Consultation with PAPs and communities is not required for any scale of the project.	The language of the consultations will be French and Lingala. The most suitable design of public consultation needs to be discussed and implemented in the following F/S, considering the unstable security condition of the Project Area.
9	Appropriate participation of affected people must be promoted in the	Affected asset owners will participate in the acquisition process. (Article 6)	Participation of PAPs in the resettlement	During the Pre-F/S, the JICA Study Team explained the necessity of RAP and

	JICA Guidelines, WB OPs	Law 77-001 of 22 February 1977 on Expropriation for Reasons of Public Utility	Gap	Bridging Measures
	planning, implementation, and monitoring of resettlement action plans.	Preparation of RAP is not required, and participation of PAPs in the resettlement process is not legally defined.	process is not legally defined	participation of affected persons to CI, OVD, and OR. All the institutions agreed the principle, said that they have implemented the same policy in previous WB- assisted projects, and promised that the policy of the JICA Guidelines will be followed in the future phase of the University Avenue Project. The most suitable design of public participations needs to be discussed and described in RAP in the following F/S, considering the unstable security condition of the Project Area.
10	Appropriate and accessible grievance mechanisms must be established for the affected people and their communities.	When no agreement is reached, the court will conduct the expert survey and hearing then bring its decision (Article 13 - 17).	The most accessible branch of public offices for the public is Commune Offices. The Law is not clear about the role of Commune Offices.	In the following F/S, examples of grievance redress mechanism in previous projects must be collected. The accessibility of the mechanisms for the public must be assessed. Suggestions for additional technical/legal assistance to the PAPs must be made by the JICA Study Team if the previous examples are found not easy to access by general public.
11	Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves as <b>an eligibility cut- off date</b> , asset inventory, and socioeconomic survey), preferably at the project identification stage, <b>to prevent a subsequent influx of encroachers</b> of others who wish to take advantage of such benefits. (WB OP4.12, Para. 6)	Information such as full identity of the persons concerned must be included in the decision to start the process of expropriation (Article 6). Inquiry of properties by the experts may be made prior to the commencement of the expropriation proceedings (Article 12).	No gap.	In the following F/S, the JICA Study Team must discuss with CI and Communes about the strategy to prevent a subsequent influx of encroachers in the Project Area, together with the strategy to implement the baseline survey safely.
12	Eligibility of benefits includes, the PAPs who have formal legal rights to land (including customary and traditional land rights recognized	Rights other than immovable property are expropriated jointly with the immovable they affect (Article 1).	It is not clear if the PAPs who do not have formal legal rights to land at the time of census but have a	In the following F/S, eligible PAPs of benefits, such as assistances for loss other than land and assets, based on the JICA Guidelines must be studied in detail.



	JICA Guidelines, WB OPs	Law 77-001 of 22 February 1977 on Expropriation for Reasons of Public Utility	Gap	Bridging Measures
	under law), the PAPs who don't have formal legal rights to land at the time of census but have a claim to such land or assets and the PAPs who have no recognizable legal right to the land they are occupying. (WB OP4.12 Para. 15)		claim to such land or assets and the PAPs who have no recognizable legal right to the land they are occupying are eligible for any benefits.	The policy of the JICA Guidelines for provision of the benefits for those who are not legal land owner must be explained to CI and other related institutions so that the benefits are provided for those eligible.
13	Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based. (WB OP4.12 Para. 11)	Option of land-based resettlement strategy is not included in the Law.	Option of land-based resettlement strategy is not included in the Law.  The Project Area is urban, and farming activity is not popular or large-scale in the Project Area.	In the following F/S, PAPs whose livelihoods are land-based must be identified. The policy of the JICA Guidelines for land-based resettlement must be explained to CI and other related institutions so that suitable compensation and/or assistances are provided for those eligible.
14	Provide support for the transition period (between displacement and livelihood restoration). (WB OP4.12 Para. 6)	Provision of support for the transition period is not included in the Law.	Provision of support for the transition period is not included in the Law.	In the following F/S, the types of livelihoods of PAPs must be identified. The policy of the JICA Guidelines for transition period must be explained to CI and other related institutions so that suitable assistances are provided for those eligible.
15	Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc. (WB OP4.12 Para. 8)	Attention to the needs of the vulnerable groups is not included in the Law.	Attention to the needs of the vulnerable groups is not included in the Law.	In the following F/S, vulnerable groups must be defined in the RAP. The policy of the JICA Guidelines for vulnerable groups must be explained to CI and other related institutions so that suitable assistances are provided for those eligible.

Source: The Study Team

### 7.3.2 Existing Conditions, Alternatives, and Potential Impacts

The existing University Avenue is a two to four lane road. The first 3.5 km (Section A1) has a wide space generally kept open, but it is used relatively intensive by vendors. After Yolo-Ezo IS, the cross section of the existing road is barely enough for two lanes. Just after the Yolo-Ezo IS at around PK4.0 Km, the road has been broken and impassable at the river crossing point since 2018.

The Project aims to improve University Avenue to be an all-year passable road for vehicles, and to

increase the number of lanes and secure the space for bus and taxi stops, as well as the space for footpaths and drainage. To achieve the target, land acquisition along the existing road space will be necessary.

Alternatives of the Project were compared to pursue the realistic plan for project implementation as summarized in Table 7.2.5.

In Pre-F/S, the exact boundary of public land for road ROW have not received from the DRC Government. Survey of structure, topography, and direct interview with potential PAPs were also avoided from the viewpoint of security concerns. The magnitude of expected impacts and potential resettlement was calculated from satellite imagery and field observations. Preliminary counts of affected land and structures are described in Table 6.2.1 up to Table 6.2.6.

### **7.3.3 Method and Assumptions Used to Estimate the Impacts**

#### **(1) Land Area to be Acquired**

##### 1) Steps

1. Land registration data, including the division of public and private land, was not provided from the DRC Government. Therefore, the Study Team purchased the most recent and high resolution satellite photos of the area including the target road.
2. The alternate alignments were drawn on the satellite photos using AutoCAD software.
3. Structures to be affected by each alternative ROW were identified on the satellite photos and numbered. The outline of the structure was identified using GIS software
4. For the 'Full acquisition of affected structures' case, the area covered by the affected structures was added.
5. For the 'Slice at ROW boundary' case, the area to be taken by the road was calculated for each structure to be affected.

##### 2) Assumption and Conditions

The land area shown in Table 6.2.1 has the following limitations:

1. The data does not include the area which are not covered by structures.
2. The data may include public-owned land.

#### **(2) Structures to be Compensated**

##### 1) Steps

1. For the 'Full acquisition of affected structures' case, the area covered by the affected structures was added.
2. For the 'Slice at ROW boundary' case, the area to be taken by the road was calculated for each structure to be affected.

3. Since the unit price of compensation will be different depending the structure type, a field survey was done, and video of the road-side structures were captured. Using the video data, possible number of floors of each structure which might be affected was identified.

### **(3) Number of Businesses to be Affected**

#### 1) Assumption and Conditions

The number of businesses shown in Table 6.2.4 has the following limitations.

1. The number of businesses was estimated by multiplying the number of buildings to be affected by 3. Some buildings house 4, 5 or more shops and businesses. Some buildings are used only for residential purpose. Based on field survey, 3 businesses per building was considered appropriate for the estimation at this Project phase.

### **(4) Number of Households to be Relocated**

#### 1) Steps

1. For the 'Full acquisition of affected structures' case, the area covered by the affected structures was multiplied by number of floors used for residential purpose, based on the field identification. Total residential floor area to be lost was calculated for each structure. Then the residential floor area was divided by 7.0, the floor area per capita obtained from the Traffic Survey. The number of residents to be affected was then divided by 5.5, the average household size, to obtain the number of households to be relocated.
2. For the 'Slice at ROW boundary' case, the floor area to be taken by the road was calculated for each structure to be affected. The area covered by the affected structures was multiplied by number of floors used for residential purpose, based on the field identification. Total residential floor area to be lost was calculated for each structure. Then the residential floor area was divided by 7.0, the floor area per capita obtained from the Traffic Survey. The number of residents to be affected was then divided by 5.5, the average household size, to obtain the number of households to be relocated.

#### 2) Assumption and Conditions

The number of households shown in Table 6.2.5 and Table 6.2.6 have following limitations.

1. The number of households was estimated by using the average number of floor area per capita and average number of household size. When the actual census survey is conducted, the results may differ from the estimated number in Table 6.2.5 and Table 6.2.6.

### **(5) Estimation of Unit Price for Land Compensation**

The Study Team surveyed market price of 37 land parcels in the Study Area in 2018 by asking private land agencies. The study included 3 land parcels near University Avenue, 2 in Ngaba Commune and 1 in Makala Commune. Average unit price of those parcels is 185.33USD/m<sup>2</sup>. The unit price calculated from the total price of three parcels is 190.58USD/m<sup>2</sup>. Therefore, it was decided to use 200USD/m<sup>2</sup> as land price assumption. In the next phase of the Project, realistic replacement value for the structure must be studied.

**Table 7.3.4 Proposed TOR for LAP and RAP Study**

No.	Class/Area	Category	Commune	Size of Area	Unit Price (USD/ m <sup>2</sup> )	Size of Area (m <sup>2</sup> )	Price of Land (USD)
1	District Centre	Commercial	Ngaba	6m x 23m	159	138	22,000
2	Low-Middle	Residential	Makala	6m x 28m	268	168	45,000
3	Low-Middle	Residential	Ngaba	7m x 20m	129	140	18,000
Total						446 (A)	85,000 (B)
Average (USD)					185.33	190.58 (B/A)	

Source: The Study Team

### (6) Estimation of Structure Compensation

Two examples of structure price sets were compared. Definition of the Building Categories were not accessible to the Study Team. Unit price for building is given for unit floor area (m<sup>2</sup>). The Study Team understood that the difference of unit price reflects the difference of floor numbers. Therefore, it was decided to use 850USD/m<sup>2</sup> for building more than two floors, and 500USD/m<sup>2</sup> for building with ground floor only. In the next phase of the Project, realistic replacement value for the structure must be studied.

**Table 7.3.5 Proposed TOR for LAP and RAP Study**

Building Category	PURUS RAP 2009 (p.36)	Congo-Japon Boulevard
A	-	650.0 – 850.0
B	-	550.0 - 750.0
C	166.4	-
D	145.6	350.0 – 500.0
E	104.0	250.0 - 300.0
F	62.4	120.0

Source: *Plan de réinstallation de la composante 4 du PURUS, Version complète finale, R 1168 – JUIN 2010*

*Tableau d'identification et d'évaluation des habitations à exproprier sur l'avenue des poids lourds (preparation year unknown)*

### (7) Estimation of Moving Assurances

In the PURUS RAP, monthly rent of 50USD for three months plus moving cost of 300USD, 450USD in total, were paid for households and businesses that is required to relocate. The site of the PURUS project is very remote part of Kinshasa, near Bonobo Conservation Area. The price for structure compensation is significantly lower in PURUS compared to that in Congo-Japon Boulevard because of the remote location of the site. Therefore, the Study Team decided to double the moving assurances to monthly rent of 100USD for three months plus moving cost of 600USD, 900USD in total, for the University Avenue project that is located in urban condition same as Congo-Japon Boulevard.

### **7.3.4 Avoidance and Minimization of Negative Impacts**

#### **(1) Long-Term Regional Perspective**

The area along University Avenue is already under high demand for urbanization with higher population density with many of multi-story buildings. Therefore, it can be easily envisioned that the later the improvement is implemented, the greater number of residents and businesses will be affected.

If the authority fails to implement the improvement project, the road network in Kinshasa will remain unsuitable for vehicular traffic, and eventually it will not be able to support the economic activities sufficient to feed the increasing population in near future.

Given the above perspective, it can be concluded that earliest implementation of the Project is the best counter-measure to minimize the negative impacts from resettlement and from an ineffective road network.

#### **(2) Project-specific Perspective**

Land acquisition and resettlement will not be avoidable to achieve the road capacity necessary for the project road in 2030 and 2040 as envisioned in the Urban Transport Master Plan.

The responsible authorities of national, provincial and local levels will need to cooperate with each other to build a public consensus among people in the Project Area, so as to make it possible to implement the Project in peaceful and smooth manner. All potential stakeholders and those who will lose their assets or residences should be contacted and be well informed about their rights and the Project policy for compensation and assistances. The process of the Project implementation should be made clear and open, including how they can get project information, how they can raise questions, and how they can raise and file grievances.

### **7.3.5 Proposed TOR for LAP and RAP Study**

Table 7.3.6 shows TOR for the LAP and RAP study.

**Table 7.3.6 Proposed TOR for LAP and RAP Study**

	<b>Survey</b>	<b>Objective</b>	<b>Method</b>
Development of the Land Acquisition Plan	a. Land ownership survey	To list up land parcels and owners to be affected To list up non-resident land owners to be affected	1. Consultant will be authorised and assisted by CI to conduct the survey 2. Obtain parcel map and land registration office from commune level Cadastre Office 3. Prepare mosaic map of the land parcels to be affected 4. List up the parcel numbers and owner names
	b. Survey on cost estimation method for compensation for land	To clarify stakeholders and decision makers. To clarify method of decision making of price of land	5. Clarify the land acquisition and compensation determination process with CI, Province, and all Communes to be affected 6. Interview the nominated, or potential assessor(s) to confirm the method of price estimation
	c. Land price survey	To obtain market price of land parcels to be affected	7. Contact private land brokers 8. Obtain offering prices of land parcels in similar locations and land uses 9. Compare the obtained data with the assessor(s) evaluation for confirmation
Development of the Resettlement Acquisition Plan	d. Population census survey	To count number of residents, households, businesses, workers to be affected	10. Consultant will be authorised and assisted by CI to conduct the survey 11. Using the parcel map, identify land owners on-site (resident), or absentee (non-resident). 12. Using interview format based on the WB style, record the residents, households, and businesses in the structures to be affected. 13. Identify persons and households who need special attention about their vulnerability against impacts. 14. With the assistance of surveyors, assess the magnitude of impacts whether relocation will be necessary or not 15. Ask the interviewee about the preference of compensation (i.e. provision of alternate land/housing, cash compensation for land/structure) and relocation assistance 16. As much as possible and acceptable, map and photo record the house and interviewee so that the identity of the listed PAH can be identified in the later phase of the Project
	e. Business survey	To understand business income so that suitable assistance will be given, and the business environment will at least remain the same level after the relocation.	17. Consultant will be authorised and assisted by CI to conduct the survey 18. With the parcel map and assistance of surveyors, list all the immovable businesses to be affected 19. Record the characteristics of those businesses including information of number of workers 20. Map and photo record the businesses 21. With the assistance of surveyors, assess the magnitude of impacts whether relocation will be necessary or not 22. Ask the interviewee about the preference of compensation (i.e. provision of alternate land/housing, cash compensation for land/structure) and relocation assistance 23. As much as possible and acceptable, map and photo record the business and interviewee so that the identity of the listed business can be

	Survey	Objective	Method
	e. Asset census survey	To count number and types of assets to be affected	identified in the later phase of the Project 24. Consultant will be authorised and assisted by CI to conduct the survey 25. With the assistance of surveyors, list all the private and public assets to be affected 26. Identify and record the owner and/or manager of those assets 27. Map and photo record the assets
	f. Socio-economic survey	To understand income and living conditions of residents to be relocated so that suitable assistance will be given, and living conditions will at least remain the same level after the resettlement.	28. Consultant will be authorised and assisted by CI to conduct the survey 29. Select at least 20 % of the PAHs to be affected so that the sample will reflect the characteristics of all the PAHs. 30. Using interview format based on the WB style, record the socio-economic conditions and living standards of the PAHs to be affected.
	g. Market price survey	To determine appropriate price (replacement cost) of assets to be lost to calculate necessary compensation budget.	31. Interview the nominated, or potential assessor(s) to confirm the method of price estimation for the listed assets 32. Go to market and contact private contractors to obtain information for replacement costs for the listed assets 33. Obtain governmental cost unit price 34. Compare the market data with the governmental evaluation for confirmation

Source: The Study Team

### 7.3.6 Schedule for RAP Study

Although there are no specific guidelines in DRC related to the review of RAP or land acquisition plan (LAP), ACE has been reviewing RAP and LAP during their review process of EIA (ESIA) in the past projects supported by foreign or international projects.

It will be necessary to coordinate the procedure of land acquisition required by ‘Law 77-001 of 22 February 1977 on Expropriation for Reasons of Public Utility’ with the survey and planning of land acquisition and resettlement required by JICA Guidelines.

### 7.3.7 Necessary Budget for RAP Study

Preliminary budget showing survey cost for unit number of data submitted by the local consultant that assisted the IEE study is summarized in Table 7.3.7. Since the actual number of the survey target will vary depending on the selected Option, the survey cost will also vary by the Option.

**Table 7.3.7 Preliminary Cost Estimation of RAP Study (Summary)**

(unit: USD)

1. Development of the Land Acquisition Plan	a. Land ownership survey (per 100 land lots)	Remuneration cost	5,375
		Direct cost	4,500
	b. Land price survey	Remuneration cost	5,025
		Direct cost	1,500
	c. Survey on cost estimation method for land acquisition (compensation)	Remuneration cost	20,275
		Direct cost	0
2. Development of the Resettlement Action Plan	d. Population census survey (per 100 households)	Remuneration cost	50,875
		Direct cost	4,500
	e. Asset census survey (per 100 households)	Remuneration cost	15,075
		Direct cost	0
	f. Socio-Economic survey (per 50 households/businesses)	Remuneration cost	33,450
		Direct cost	1,500
	g. Market price survey	Remuneration cost	31,350
	Direct cost	1,800	

Source: The Study Team

### (1) Development of the land acquisition plan

#### 1) Land ownership survey

The survey aims to list up land parcels and owners to be affected, and also to list up non-resident land owners to be affected.

**Table 7.3.8 Estimation of Remuneration Cost for Land Ownership Survey (cost per 100 land lots)**

Item: Land ownership survey		Chief expert	Experts	Assistants	Total
	<b>Unit: USD</b>	<b>175</b>	<b>150</b>	<b>75</b>	
1. Obtaining cadastral map	Day	1	1	1	1,075
	No. of persons	1	4	4	
	Cost (USD)	175	600	300	
2. Overlaying the right of the way and the cadastral map	Day	1	1	1	1,075
	No. of persons	1	4	4	
	Cost (USD)	175	600	300	
3. Identifying and listing the land parcels to be acquired for the project	Day	1	1	1	1,075
	No. of persons	1	4	4	
	Cost (USD)	175	600	300	
4. Obtaining land registration data of the land parcels to acquired	Day	1	1	1	1,075
	No. of persons	1	4	4	
	Cost (USD)	175	600	300	
5. Preparing list of project-affected persons who will be the target for population census survey and Socio-Economic survey.	Day	1	1	1	1,075
	No. of persons	1	4	4	
	Cost (USD)	175	600	300	
<b>Grand total (USD)</b>		<b>875</b>	<b>3,000</b>	<b>1,500</b>	<b>5,375</b>

Note: Above table shows cost for land ownership survey of 100 land lots. Depending on selected Option, actual number of survey targets will vary.

Source: The Study Team



**Table 7.3.9 Estimation of Direct Cost for Land Ownership Survey (cost per 100 land lots)**

Item: Landowner ship survey	Unit Price	Number	Total
	A	B	C = AxB
Obtaining cadastral map	500 (USD)	5 Communes	2,500 (USD)
Obtaining land registration data	20 (USD)	100 data	2,000 (USD)
<b>Grand total (USD)</b>			<b>4,500 (USD)</b>

Note: Above table shows cost for land ownership survey of 100 land lots. Depending on selected Option, actual number of survey targets will vary.

Source: The Study Team

2) Land price survey

The survey aims to obtain market price of land parcels to be affected.

**Table 7.3.10 Estimation of Remuneration Cost for Market Land Price Survey**

Item: Land price survey		Chief expert	Experts	Assistants	Total
	Unit: USD	175	150	75	
Survey of official valuation	Day	3	5	5	
Survey of recent, same type, same location purchase record	No. of persons	1	4	4	
<b>Grand total (USD)</b>		<b>525</b>	<b>3,000</b>	<b>1,500</b>	<b>5,025</b>

Source: The Study Team

**Table 7.3.11 Estimation of Direct Cost for Market Land Price Survey**

Item: Land price survey	Unit Price	Number	Total
	A (USD)	B	C = AxB
Obtaining land ownership data	100 (USD)	5 Communes	500 (USD)
Administration fees	10 (USD)	100 data	1,000(USD)
<b>Grand total (USD)</b>			<b>1,500</b>

Source: The Study Team

3) Survey cost concerned with estimation method of land acquisition (compensation)

The survey aims to clarify stakeholders and decision makers, and to clarify method of decision making of official land price so that the price is based on market price and replacement cost.

**Table 7.3.12 Estimation of Remuneration Cost for Official Land Price (Compensation) Survey**

Item: Cost Estimation Method		Chief Expert	Experts	Assistants	Total
Unit Price per day	(USD)	175	150	75	
Legal survey	Day	10	15	15	15
	No. of persons	1	4	4	
	Cost (USD)	1,750	9,000	4,500	15,250
Past experience survey	Day	3	5	5	5
	No. of persons	1	4	4	
	Cost (USD)	525	3,000	1,500	5,025
<b>Grand total (USD)</b>		<b>2,275</b>	<b>12,000</b>	<b>6,000</b>	<b>20,275</b>

Source: The Study Team

## (2) Development of the Resettlement Action Plan

### 1) Population census survey

The survey aims to count number of residents, households, businesses, workers to be affected.

**Table 7.3.13 Estimation of Remuneration Cost for Population Census Survey (cost per 100 households)**

Item: Population census survey		Chief Expert	Expert	Assistant	Total
Unit Price per day (USD)		USD 150	USD 75	USD 50	
Preparation survey permission	Day	3	3	3	
	No. of persons	1	1	1	
	Cost	450	225	150	825
Obtaining survey permission	Day	1	1	1	1
	Cost	20	20	20	60
Interview survey (Resident household) (including squatters)	Day	10	15	15	15
	No. of persons	1	4	4	
	Cost	1,750	9,000	4,500	15,250
Interview survey (Business (informal))	Day	10	15	15	15
	No. of persons	1	4	4	
	Cost	1,750	9,000	4,500	15,250
Mapping and enumeration	Day	10	15	15	15
	No. of persons	1	4	4	
	Cost	1,750	9,000	4,500	15,250
Reporting	Day	4	8	8	20
	No. of persons	1	2	2	
	Cost	700	2,400	1,200	4,300
<b>Grand total (USD)</b>					<b>50,875</b>

Note: Above table shows cost for population census survey of 100 households. Depending on the selected Option, actual number of survey targets will vary.

Source: The Study Team

**Table 7.3.14 Estimation of Direct Cost Population Census Survey (cost per 100 households)**

Item: Population census survey	Unit Price (USD)	Number	Total Price (USD)
	A	B	C = AxB
Cost for assistance from Commune-level Property Agency	500	5 communes	2,500
Transport allowance	20	100	2,000
<b>Grand total (USD)</b>			<b>4,500</b>

Source: The Study Team

2) Asset census survey

The survey aims to count number and types of assets to be affected.

**Table 7.3.15 Estimation of Remuneration Cost for Asset Census Survey (cost per 100 households)**

Item: Asset census survey	Target number (tentative)		Chief Expert	Expert	Assistant	Total
Unit Price per day (USD)			USD 175	USD 150	USD 75	
List the assets to be affected	100	Day	3	5	5	
		No. of persons	1	4	4	
		Cost	525	3,000	1,500	5,025
Mapping and enumeration	100	Day	3	5	5	
		No. of persons	1	4	4	
		Cost	525	3,000	1,500	5,025
Reporting	100	Day	3	5	5	
		No. of persons	1	4	4	
		Cost	525	3,000	1,500	5,025
<b>Grand total (USD)</b>						<b>15,075</b>

Note: Above table shows cost for asset census survey of 100 households. Depending on the selected Option, actual number of survey targets will vary.

Source: The Study Team

3) Socio-Economic survey

To understand income and living conditions of residents to be relocated so that suitable assistance will be given and living conditions will at least remain at the same level even after resettlement.

To understand business income so that suitable assistance will be given and the business environment will at least remain at the same level even after the relocation.

**Table 7.3.16 Estimation of Remuneration Cost for Socio-Economic Survey (cost per 50 samples)**

Item: Socio-economic survey	Target Number (tentative)		Chief Expert	Expert	Assistant	Total
Unit Price per day (USD)			USD 175	USD 150	USD 75	
Interview survey (resident household) (including squatters)	50	Day	7	10	10	
		No. of persons	1	4	4	
		Cost	1,225	6,000	3,000	10,225
Interview survey (Business formal)	50	Day	7	10	10	
		No. of persons	1	4	4	
		Cost	1,225	6,000	3,000	10,225
Enumeration	50	Day	7	10	10	
		No. of persons	1	4	4	
		Cost	1,225	6,000	3,000	10,225
Reporting		Day	3	5	5	
		No. of persons	1	2	2	
		Cost	525	1,500	750	2,775
<b>Grand total (USD)</b>						<b>33,450</b>

Note: Above table shows cost for socio-economic survey of 50 households/businesses. Depending on selected Option, actual number of survey targets will vary.

Source: The Study Team

**Table 7.3.17 Estimation of Direct Cost for Socio-Economic Survey**

Item: Socio-economic survey	Unit Price (USD)	Number	Total Price (USD)
	A	B	D = AxB
Communication	300	1	300
Transport	500	1	500
Survey materials and other direct costs	700	1	700
<b>Grand total (USD)</b>			<b>1,500</b>

Source: The Study Team

#### 4) Market price survey

The survey aims to determine appropriate price (replacement cost) of assets to be lost and estimate necessary compensation budget.

**Table 7.3.18 Estimation of Remuneration Cost for Market Price Survey of Assets (cost per 50 samples)**

Item: Market price survey	Target number (tentative)		Chief Expert	Expert	Assistant	Total
Unit Price per day (USD)			USD 175	USD 150	USD 75	
Survey of structure price by structure types	50	Day	3	5	5	13
		No. of persons	1	4	4	
		Cost	525	6,000	3,000	9,525
Survey of price of crops and trees	50	Day	3	5	5	13
		No. of persons	1	4	4	
		Cost	525	6,000	3,000	9,525
Survey of moving cost for affected assets (fuel, vehicle and manpower)	50	Day	3	5	5	13
		No. of persons	1	4	4	
		Cost	525	6,000	3,000	9,525
Reporting		Day	3	5	5	13
		No. of persons	1	2	2	
		Cost	525	1,500	750	2,775
<b>Grand total (USD)</b>						<b>31,350</b>

Above table shows cost for market price survey of 50 structures, 50 crops and trees, and moving cost for affected 50 movable assets. Depending on selected Option, actual number of survey targets will vary.

Source: The Study Team

**Table 7.3.19 Estimation of Direct Cost for Market Price Survey**

Item: Market price survey	Unit Price (USD)	Number	Total Price (USD)
	A	B	C= AxB
Communication	300 (USD)	1	300 (USD)
Transport	500 (USD)	1	500 (USD)
Survey materials and other direct costs	1000 (USD)	1	1,000 (USD)
<b>Grand total (USD)</b>			<b>1,800</b>

Source: The Study Team

## **CHAPTER 8    Toward Implementation**

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### **8.1    Expected Impacts**

Various positive and negative impacts of the projects are expected. Expected impacts are described from the viewpoints of four objectives of the urban transport; namely 1) Supporting Urban Economic Activities, 2) Assuring Equity in Transport, 3) Improving Safety and Security, and 4) Achieving Environmentally Sustainable Transport as discussed in Chapter 7 of Volume 1. As the analysis below is qualitative and quantitative, analysis on impacts of the project should be conducted during the feasibility study phase.

From economic perspective, connection of CBD and the national road toward Matadi (the N1 Road) by University Avenue will significantly reduce the travel time of both passenger and cargo transport as vehicles currently have to detour either the route via Liberation Avenue or the other route via Bypass Avenue and Lumumba Boulevard. University Avenue will play a key role as a strategic road of the master plan.

Medical, educational and recreational facilities are located along University Avenue. In terms of equity in transport, the project will improve accessibility to those facilities with roads with pedestrian paths. Bus routes on University Avenue, which are currently not operated, will also improve the access of people without private vehicles. Residents along University Avenue will have motorized transport access to various urban functions such as employment, educational service, medical service and business opportunities etc. Approximately, 802,000 people reside and 117,000 persons work in the 1km width along the section between Sendwe IS and RP Ngaba of University Avenue.

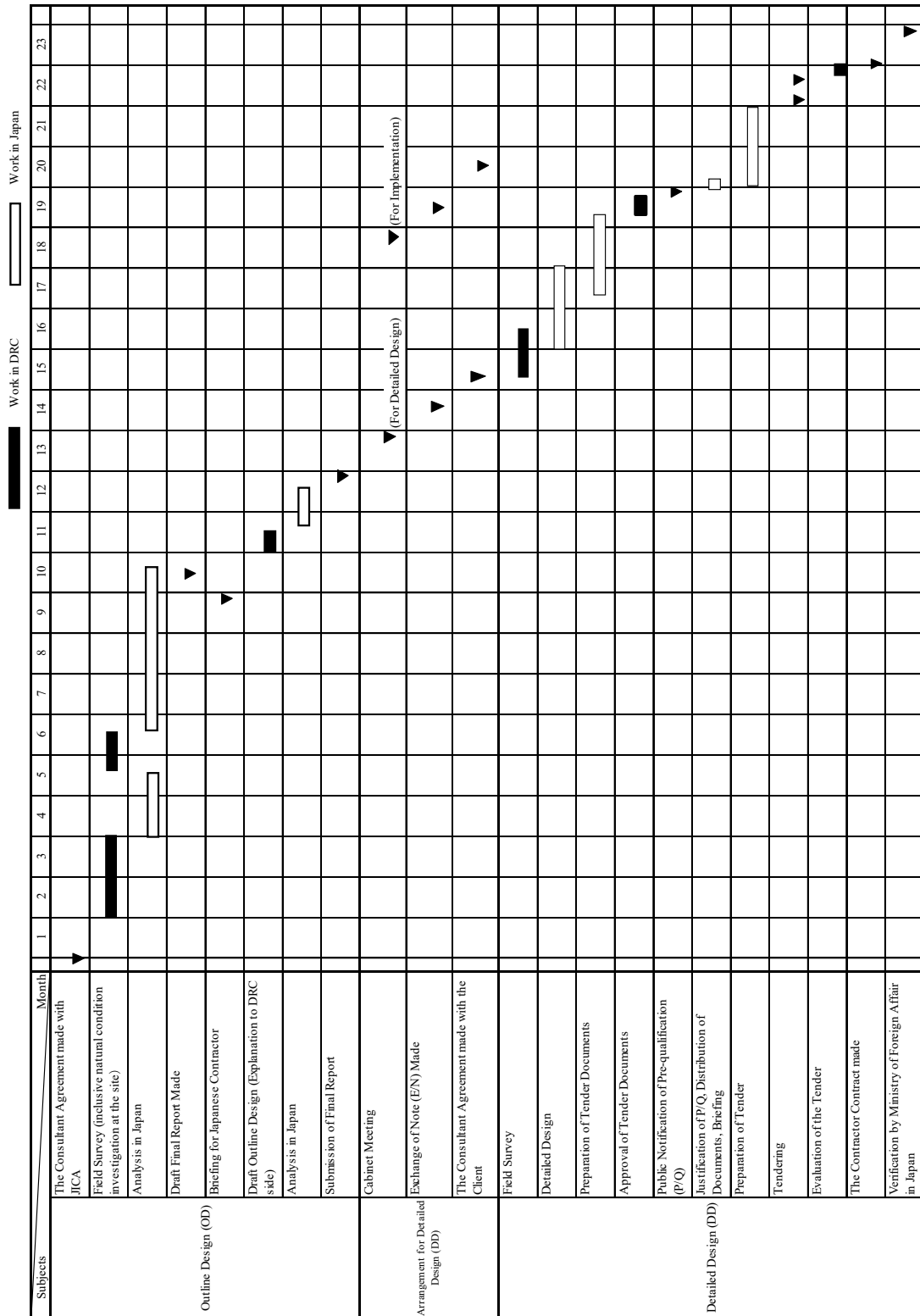
In general, reduction of traffic accidents can be expected with appropriately designed roads without potholes and substandard pavements. However, there is a risk of an increase of traffic accidents especially during the night time due to speeding as the planned road has smooth pavement and relatively straight alignment. Improvement of road safety equipment and facilities targeting speeding vehicles such as speeding enforcement camera together with strict law enforcement can alleviate these negative impacts.

The expected environmental impacts will be limited to the standard, typical impacts usually observed with road construction works and the existence of improved roads in the operation phase. Impacts from land acquisition and resettlement necessary to implement the Project will be quite large depending on the final selection of ROW width as shown in Table 6.2.1 to Table 6.2.6. Thus, land acquisition and resettlement should be conducted following international standard such as JICA's Guideline.

### **8.2    Project Schedule up to Implementation Schedule of Section A**

In the event where the Project is implemented under the Japan's Grant Aid Scheme, the draft schedule for outline design and detailed design in Figure 8.2.1. The construction supervision schedule will be assessed, after an appropriate feasible option would be determined based on the

consensus between the DRC government and the government of Japan. The estimated entire schedule up to the implementation is approximately 23.0 months, comprising approximately 12.0 months for outline design including authorized processing such as E/N and G/A and 9.0 months for detailed design. In the Project, construction period will be assumed considering construction method, material procurement, etc. The schedule (draft) up to the implementation assuming Japan's Grant Aid Scheme is shown in Figure 8.2.1 as a reference.



Source: The Study Team

**Figure 8.2.1 Implementation Schedule of Section A**

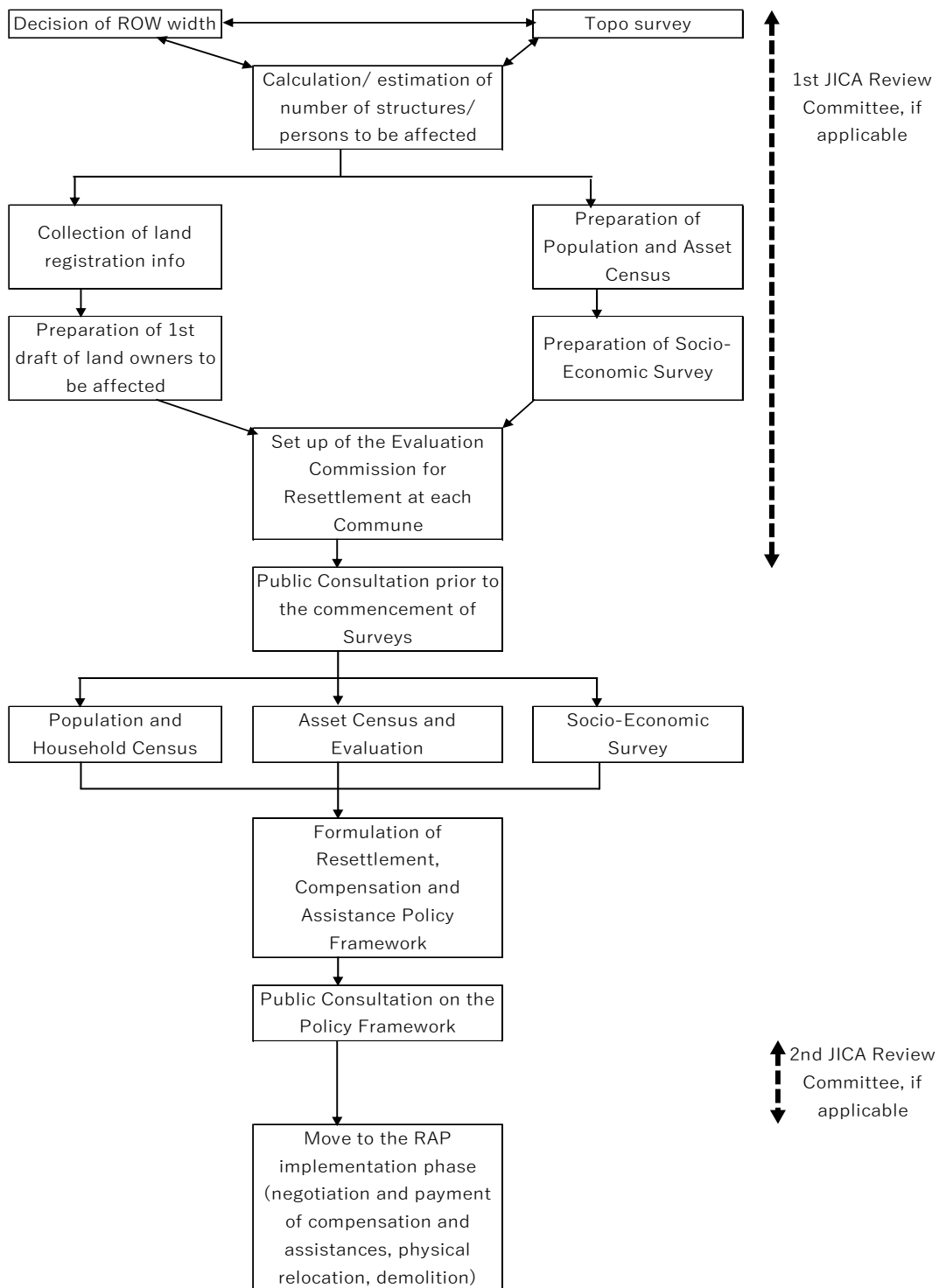


### **8.3 Process of Land Acquisition, Relocation, Resettlement and Rehabilitation**

The process of land acquisition, relocation, resettlement and rehabilitation is expected to be the same as the Congo-Japon Boulevard Project. It will be necessary that a project-specific Decree is issued by the Minister of Infrastructure, Public Works and Reconstruction. Then, based on the Decree, the commission for the evaluation of concessions and buildings in the land required by the University Avenue Project will be established either for each Quartier or for all the affected Quartier.

Considering the security condition of the Project Area, various surveys required by the JICA Guidelines will need to be accompanied by a member or a deputy of a member of the commission.

The steps up to the implementation of the RAP is shown in Figure 8.3.1.



Source: The Study Team

**Figure 8.3.1 Process of Land Acquisition, Relocation, Resettlement and Rehabilitation**