CHAPTER 5   Vision for Sustainable Spatial Development (Vision 2040)

5.1   Population Growth and Control

5.1.1   Prospect of Population Growth of Kinshasa City

The Study refers to the result of the future population growth analysis by the UN (United Nations) Population Division for the estimation of future population (ref. 5.2.4 and 5.2.5). The index of UN statistics reflects the natural population growth ratio and social population growth ratio; It calculates the population of all of DRC (Democratic Republic of the Congo) between 1950 and 2100, prepares three variants (Low, Medium and High) for the estimation for the whole country of DRC. The Study takes these indexes as the natural increase population growth ratio for Kinshasa City.

Then, the Study examined two scenarios for the assumption of social increase of population in Kinshasa City. As described in 5.2.4, the current annual social population growth ratio of Kinshasa City is considered at about 1%/year, which corresponds to the difference between the annual population growth ratio of the entire DRC and Kinshasa City. Currently, this increasing tendency is considered to be caused by the following issues.

- Economical differences between Kinshasa City and local cities;

- Difference of job opportunity and educational opportunity; and

- Unstable political situation and internally displaced persons.

Considering the above mentioned causes of migration, and the fact that the urbanized area of Kinshasa City has expanded and is sprawled, it is doubtful that this trend of migration into Kinshasa City would continue for a long time.

On the other hand, from the viewpoint of regional and national development, the government of DRC might need to consider decentralization of the overcrowded capital, relocating commercial and industrial functions to other regions of the country.

According to these views, the Study examines two scenarios of population increase of Kinshasa City. One is the constant annual population increase rate of 1.0% from 2017 to 2040 (Scenario A), and the other is gradually decreasing the population increase rate of 1.0% to 0.0% from 2017 to 2040 (Scenario B).

Applying these population growth ratios to the current population of Kinshasa City, the Study then evaluates the result.

Table 5.1.1   Constant Social Population Growth Ratio between 2015-2040, 1.0% Annually

Period	SOSAK*	UN (Low fertility variant + social growth 1%)			UN (Medium fertility variant + social growth 1%)			UN (High fertility variant + social growth 1%)		
		Whole DRC	Social	Total	Whole DRC	Social	Total	Whole DRC	Social	Total
2013-15	3.00	3.17	1.00	4.17	3.17	1.00	4.17	3.17	1.00	4.17
2015-20	3.00	2.94	1.00	3.94	3.09	1.00	4.09	3.24	1.00	4.24
2020-25	3.00	2.73	1.00	3.73	2.96	1.00	3.96	3.18	1.00	4.18
2025-30	3.00	2.53	1.00	3.53	2.81	1.00	3.81	3.08	1.00	4.08
2030-35	3.00	2.39	1.00	3.39	2.66	1.00	3.66	2.92	1.00	3.92
2035-40	3.00	2.22	1.00	3.22	2.51	1.00	3.51	2.78	1.00	3.78
2040-45	3.00	2.02	1.00	3.02	2.34	1.00	3.34	2.65	1.00	3.65

Source: The Study Team   *: Strategic Orientation Scheme for the Kinshasa Metropolitan Area

Table 5.1.2   Case of Gradual Decrease of Social Population Growth Ration between 2015-2040 (1.0% Annually in 2015 to 0.0% in 2035)

Period	SOSAK	UN (Low fertility variant + social growth 1-> 0%)			UN (Medium fertility variant + social growth 1 -> 0%)			UN (High fertility variant + social growth 1 -> 0%)		
		Whole DRC	Social	Total	Whole DRC	Social	Total	Whole DRC	Social	Total
2013-15	3.00	3.17	1.00	4.17	3.17	1.00	4.17	3.17	1.00	4.17
2015-20	3.00	2.94	1.00~0.75	3.94~3.74	3.09	1.00~0.75	4.09~3.89	3.24	1.00~0.75	4.24~4.04
2020-25	3.00	2.73	0.75~0.50	3.48~3.28	2.96	0.75~0.50	3.71~3.51	3.18	0.75~0.50	3.93~3.73
2025-30	3.00	2.53	0.50~0.25	3.03~2.83	2.81	0.50~0.25	3.31~3.11	3.08	0.50~0.25	3.58~3.38
2030-35	3.00	2.39	0.25~0.00	2.64~2.44	2.66	0.25~0.00	2.91~2.71	2.92	0.25~0.00	3.17~2.97
2035-40	3.00	2.22	0.00	2.22	2.51	0.00	2.51	2.78	0.00	2.78
2040-45	3.00	2.02	0.00	2.02	2.34	0.00	2.34	2.65	0.00	2.65

Source: The Study Team

5.1.2   Verification of Population Growth Result of Different Population Increase

The following two tables show the estimated population of the Kinshasa City corresponding to different scenarios.

Table 5.1.3   Estimated Population Growth Ration of Kinshasa City (Scenario A)

Year	SOSAK (Based on INS* benchmark in 2015)	SOSAK (Based on Consultant's benchmark in 2015)	UN (Low fertility variant) + social growth 1%)	UN (Medium fertility variant) + social growth 1%)	UN (High fertility variant) + social growth 1%)
2013	10,558,000	8,200,000	-	-	-
2015	11,575,000	8,826,000	11,575,000	11,575,000	11,575,000
2017**	-	-	12,505,000	12,505,000	12,505,000
2020	13,025,000	10,233,000	14,042,000	14,103,000	14,164,000
2025	15,133,000	11,862,000	16,864,000	17,125,000	17,382,000
2030	17,582,000	13,751,000	20,058,000	20,646,000	21,230,000
2035	N/A	N/A	23,696,000	24,711,000	25,730,000
2040	N/A	N/A	27,765,000	29,364,000	30,975,000

Source: The Study Team   *: National Statistical Institute   **: Estimated by the Study Team

Table 5.1.4   Estimated Population Growth Ratio of Kinshasa City (Scenario B)

Year	SOSAK (Based on INS benchmark in 2015)	SOSAK (Based on Consultant's benchmark in 2015)	UN (Low fertility variant) + decreasing social growth 1%→0%)	UN (Medium fertility variant) + decreasing social growth 1%→0%)	UN (High fertility variant) + decreasing social growth 1%→0%)
2013	10,558,000	8,200,000	-	-	-
2015	11,575,000	8,826,000	11,575,000	11,575,000	11,575,000
2017*	-	-	12,505,000	12,505,000	12,505,000
2020	13,025,000	10,233,000	13,981,000	14,042,000	14,103,000
2025	15,133,000	11,862,000	16,509,000	16,766,000	17,019,000
2030	17,582,000	13,751,000	19,074,000	19,636,000	20,293,000
2035	N/A	N/A	21,623,000	22,554,000	23,489,000
2040	N/A	N/A	24,132,000	25,530,000	26,941,000

Source: The Study Team

Note*: Estimated by the Study Team

As the result of this calculation, the population of Kinshasa City will be 20 to 21 million in the year 2030, and 27 to 31 million in 2040 for Scenario A (constant migration ratio); this is 1.5 times of the estimation of SOSAK for 2030. Even taking the decreasing population increase (Scenario B), the city population will reach 19 to 20 million in 2030 and 24 to 27 million in 2040.

Considering the current urban situation of Kinshasa City, it is obvious that the concentration of the population into Kinshasa City will provoke difficulties in the living, social and natural environments of the city. Geographically, the available land of Kinshasa City is limited to a narrow space along the Congo River, and cultivation and urbanization towards the mountain side in the south might not be easy. Also, more concentration is expected to lead to more traffic congestion in the limited arterial roads. Before facing these difficulties, it is necessary to take measures to avoid and relieve the overconcentration into Kinshasa City. For this purpose, the government needs to consider other development strategies and scenarios. The Study supposes that the government will take action against the overconcentration into Kinshasa City before the situation worsens, and the trend of migration will be autonomously balanced.

The Study will take Scenario B (decreasing population increase) for the estimation, on the assumption that proper control and development strategy at the national level will be implemented in the future.
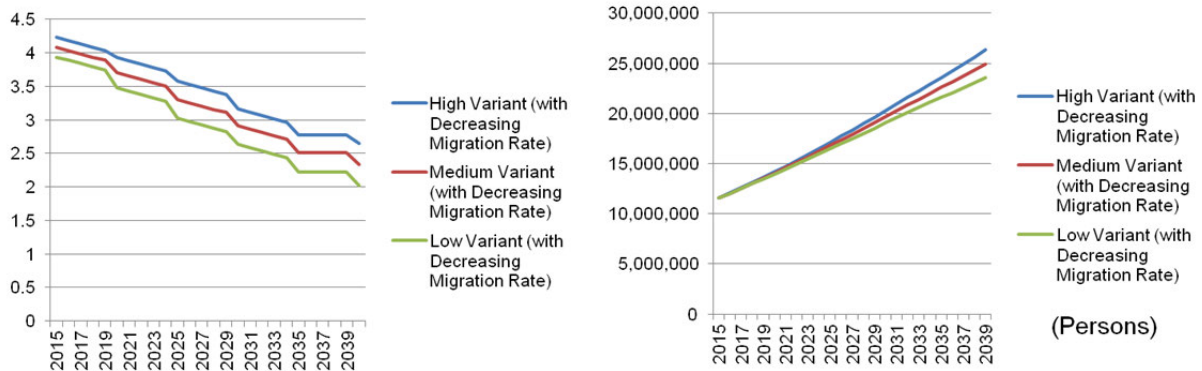
Source: The Study Team

Figure 5.1.1   Estimated Annual Rate of Population Change of Kinshasa City (Left)

Figure 5.1.2   Estimated Population number of of Kinshasa City (Right)

5.1.3   Estimation of Future Population of Communes

(1)   Process of Estimation

Corresponding to the estimated population of Kinshasa City, the Study calculates the population of each commune in the future. For the estimation and distribution, the Study will calculate by following process.

- To estimate the population growth ratio for each commune based on recent trends and current population density;

- To calculate the future population of each commune for 2030 and 2040 based on an assumed population growth ratio (initial estimation);

- To evaluate the estimate result by comparing with candidate development areas and their capacity; and

- To distribute the communal population into "in" and "out" of the Study Area, then to adjust the population sum to estimate the population of Kinshasa City.

(2)   Basis of Estimation

First, the Study estimated the population growth ratio for each commune based on recent trends and current population density. As described in 3.2.1, the trend of the population differs commune by commune, according to the respective spatial and social situation.

For estimation of the population, the Study set the following assumptions for each commune.

- Lesser increases were observed in the communes whose population density is over 500 pers/ha from 2004 to 2013. Considering this trend and for the purpose of avoiding overcrowding as a policy of urban planning, the Study sets 0% for an annual increase ratio for these communes.

- The population density of communes located in hilly areas is about 300 pers/ha. The Study

considered these findings for the setting of population growth.

- A drastic increase of population in the urbanized periphery areas has been observed. The Study assumed that such development will mostly continue in these areas.
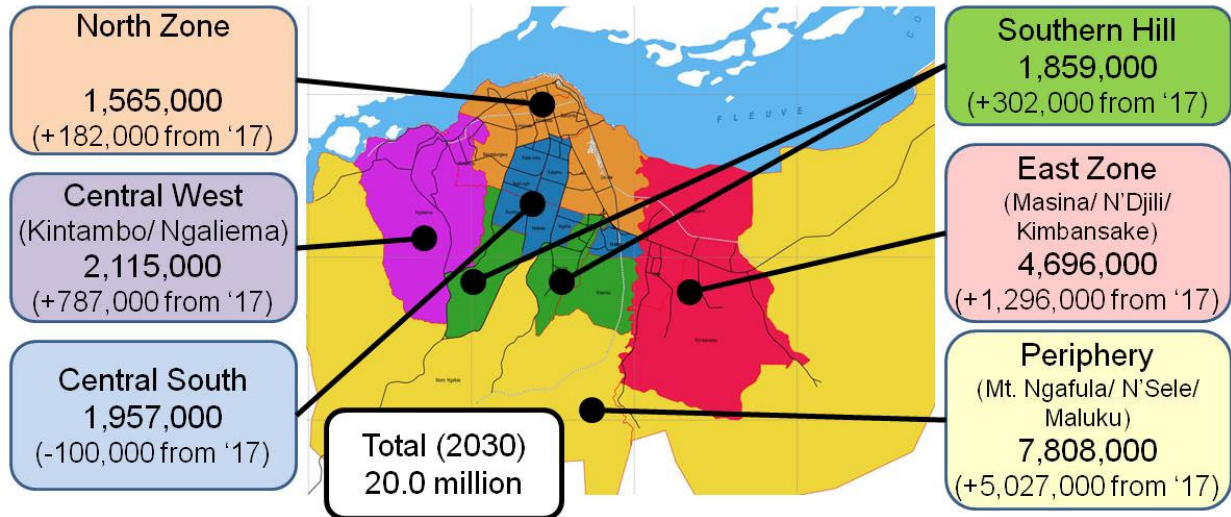
(3) Result of Initial Estimation

Applying the above mentioned assumptions for calculation, the Study set a population growth ratio for each commune.

During the calculation process, the Study tried to adjust the total sum of the population to approximately the same as the estimated number of Scenario B in the previous chapter. Finally, the Study set the initial estimated population of communes for 2030 and 2040, and the estimated annual population growth ratio for 2017-2030 and 2030-2040 as follows.

Figure 5.1.3   Initial Estimation of Population and their Annual Population Increase Ration
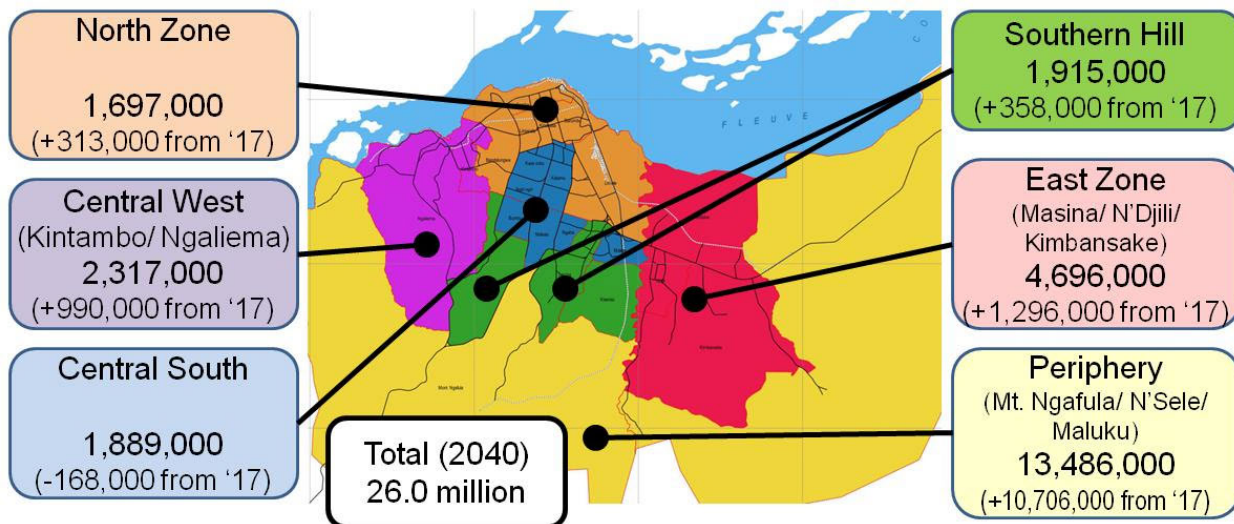
Group of Commune	Name of Commune	Estimated Population (2013) (pers)	Estimated Population Density (2013) (pers/ha)	Estimated Population Growth Ratio (2013-17)	Estimated Population (2017) (pers)	Estimated Population Density (2017) (pers/ha)	Estimated Population Growth Ratio (2017-30)	Estimated Population (2030) (pers)	Estimated Population Density (2030) (pers/ha)	Estimated Population Growth Ratio (2030-40)	Estimated Population (2040) (pers)	Estimated Population Density (2040) (pers/ha)
Residential Area (Cite Résidentielles)	Gombe	70,594	57.35	3.40%	80,696	65.56	3.40%	124,628	101.25	1.84%	149,555	121.50
	Limete	435,720	153.28	1.70%	466,113	163.98	1.70%	580,315	204.15	1.70%	686,868	241.64
	Ngaliema	977,485	152.87	4.10%	1,147,924	179.52	4.10%	1,935,408	302.68	1.00%	2,137,894	334.34
Old City (Ancienne cites)	Kintambo	152,918	387.77	4.10%	179,581	455.39	0.00%	179,581	455.39	0.00%	179,581	455.39
	Barumbu	165,720	373.04	1.00%	172,449	388.19	1.00%	196,263	441.79	0.00%	196,263	441.79
	Kinshasa	152,778	494.36	0.00%	152,778	494.36	0.00%	152,778	494.36	0.00%	152,778	494.36
	Lingwala	129,439	469.41	3.50%	148,534	538.66	0.00%	148,534	538.66	0.00%	148,534	538.66
New City (Nouvelle cite)	Ngiri-ngiri	167,019	572.61	0.00%	167,019	572.61	0.00%	167,019	572.61	0.00%	167,019	572.61
	Kasa-vubu	114,152	297.51	0.00%	114,152	297.51	0.00%	114,152	297.51	0.00%	114,152	297.51
Planned City (Cite Planifiées)	Kalamu	287,045	480.93	0.00%	287,045	480.93	0.00%	287,045	480.93	0.00%	287,045	480.93
	Lemba	449,429	311.22	3.00%	505,836	350.28	3.00%	742,838	514.39	0.00%	742,838	514.39
	Matete	330,177	687.40	1.00%	343,584	715.31	0.00%	343,584	715.31	0.00%	343,584	715.31
	Bandalungwa	322,313	458.29	3.00%	362,766	515.81	0.00%	362,766	515.81	0.00%	362,766	515.81
	N'djili	578,411	619.54	3.00%	651,007	697.29	0.00%	651,007	697.29	0.00%	651,007	697.29
Southern Suburbs (Extension Sud)	Ngaba	258,057	903.40	2.00%	279,329	997.87	1.00%	245,117	858.10	-1.00%	221,680	776.05
	Selembao	418,925	212.29	3.00%	471,504	238.94	1.00%	536,615	271.94	1.00%	592,757	300.39
	Bumbu	536,018	1,179.62	0.00%	536,018	1,179.62	-1.00%	470,367	1,035.14	-1.00%	425,392	936.16
	Makala	304,615	590.79	2.00%	329,725	639.49	0.00%	329,725	639.49	0.00%	329,725	639.49
Urban Periphery (Excentriques)	Kisenso	514,565	330.71	3.00%	579,147	372.22	0.00%	579,147	372.22	0.00%	579,147	372.22
	Masina	897,980	197.20	4.50%	1,070,858	235.17	3.00%	1,070,858	235.17	0.00%	1,070,858	235.17
	Kimbanseke	1,407,437	213.29	4.50%	1,678,395	254.36	4.50%	2,974,445	450.77	0.00%	2,974,445	450.77
	Mont-ngafula	487,722	10.69	10.00%	714,074	15.65	7.10%	2,277,776	49.91	5.85%	4,021,663	88.13
	N'sele	527,305	5.53	10.00%	772,027	8.10	10.00%	2,665,247	27.96	7.00%	5,242,945	55.00
	Maluku	872,175	0.98	10.37%	1,294,439	1.45	6.20%	2,864,783	3.21	3.95%	4,221,505	4.73
Total	**Kinshasa City**	**10,558,000**			**12,505,000**			**20,000,000**			**26,000,000**	

Source: The Study Team

Source: The Study Team

Figure 5.1.4   Result of Initial Estimation of Population of Commune (2030)

Source: The Study Team

Figure 5.1.5   Result of Initial Estimation of Population of Commune (2040)

(4)   Adjustment of Estimated Distribution of Population

In order to finalize the estimated population of the communes of Kinshasa City, the Study adjusted the initial population numbers based on the following assumptions.

- Adjustment by evaluation of development areas:

  The initial estimated population was calculated mostly based on the trends of population

increase and density. Thus, the Study evaluated the possibility of development and their capacity in this process. Then the results served as feedback for adjustment.

For this process, the Study measured the possible urbanized areas according to the analysis in Section 3.4.1. Then the Study assumed 300 pers/ha, as the capacity of future development (100 pers/ha for Maluku). Based on these results, the estimated population was then adjusted as shown in the following table.

- Distribution of population of Maluku

The Study distributed population in Maluku for "in" and "out" of the Study Area. For this process, the Study considered capacity of future development areas and the annual population growth for "out" of the Study Area (4.5%/year).

The following table shows the final result of the adjusted population of the communes of Kinshasa City.

Table 5.1.5   Final Result of Estimated Population of Communes of Kinshasa City

Group of Commune	Name of Commune	Estimated Population (2017)	Estimated Population (2030)	Estimated Population (2040)	Adjusted Population Increase (2017-40)
Residential Area (Cite Résidentielles)	Gombe	80,696	124,628	149,555	
	Limete	466,113	580,315	686,868	
	Ngaliema	1,147,924	1,935,408	2,137,894	
Old City (Ancienne Cites)	Kintambo	179,581	179,581	179,581	
	Barumbu	172,449	196,263	196,263	
	Kinshasa	152,778	152,778	152,778	
	Lingwala	148,534	148,534	148,534	
New City (Nouvelle Cite)	Ngiri-ngiri	167,019	167,019	167,019	
	Kasa-vubu	114,152	114,152	114,152	
Planned City (Cite Planifiées)	Kalamu	287,045	287,045	287,045	
	Lemba	505,836	742,838	742,838	
	Matete	343,584	343,584	343,584	
	Bandalungwa	362,766	362,766	362,766	
	N'djili	651,007	651,007	651,007	
Southern Suburbs (Extension Sud)	Ngaba	279,329	245,117	221,680	
	Selembao	471,504	536,615	592,757	
	Bumbu	536,018	470,367	425,392	
	Makala	329,725	329,725	329,725	
Eastern Suburbs (Excentriques)	Kisenso	579,147	579,147	579,147	
	Masina	1,070,858	1,070,858	1,070,858	
	Kimbanseke	1,678,395	2,974,445	2,974,445	1,296,050
	Mont-ngafula	714,074	2,277,776	4,021,663	3,307,589
	N'sele	772,027	2,665,247	5,242,945	4,770,918
	Maluku (Inside Study Area)	230,000	794,022	1,230,000	1,000,000
Sub Total	**Study Area**	**11,440,561**	**17,929,239**	**23,008,495**	
Outside Study Area	**Maluku (Outside Study Area)**	**1,064,439**	**2,070,761**	**2,991,505**	**1,927,066**
Total	**Kinshasa City**	**12,505,000**	**20,000,000**	**26,000,000**	**13,495,000**

Source: The Study Team

Therefore, the future population in the Study Area and Kinshasa City for 2030 and 2040 are estimated as presented in Table 5.1.6.

Table 5.1.6   Estimated Future Population in the Study Area and Kinshasa City

	2017	2030	2040
The Study Area	11,440,600	17,929,239	23,008,495
Kinshasa City	12,505,000	20,000,000	26,000,000

Source: The Study Team

5.2   Employment Structure and Future Changes

5.2.1   Socio-economic Framework Parameters

(1)   Parameters

- The socio-economic framework of Kinshasa City has been assumed for the basis of estimating demands in transport, infrastructure, housing and community facilities, etc. The base year has been set as 2017, and the socio-economic framework of the year 2030 and 2040 are estimated as the planning horizon. The population trends and the future population have been examined in "5.1. Population Growth and Control", and the projection of GDP (Gross Domestic Product) and employment is described in this section. The flow of developing the socio-economic framework of Kinshasa City is as follows.

- The socio-economic framework will be developed in harmony with the visions and policies prepared by the government as well as socio-economic conditions of the country. Since the objectives of PNSD (National Strategic Development Plan) of DRC include economic diversification and improvement of competitiveness as well as employment acceleration, the socio-economic framework of Kinshasa City has focused on the industrial diversification, employment growth and labour productivity growth.

- The future population, GRDP (Gross Regional Domestic Product) per capita and employment are identified as parameters for the socio-economic framework, and the trends of each parameter have been analysed. The experiences of Asian and African countries have also been reviewed for accommodating the global trends.

- The future population has been estimated as 20 million in 2030 and 26 million in 2040, based on the population growth trends in the past, urbanization progress and the potential land allocation.

- The future GRDP per capita has been identified as one of the parameters since the PNSD has focused on the acceleration of GDP per capita. The experiences of Asian and African countries have been surveyed for achieving successful development, and the high-growth scenario and low-growth scenario have been set up.

- The population structure has been targeted for estimating the employment. The population of age 15-64 has been identified as the working age population, and it is expected to grow as the population structure changes. Also, the employment to working age population ratio is expected to increase by the increasing employment opportunities. The future employment has been projected by the working age population as well as the employment to working age population ratio.

- Through the inputs of 1) population, 2) GRDP per capita, 3) working age population and 4) employment to working age population ratio, the socio-economic framework has been developed. Other parameters such as GRDP, the number of employment and labour productivity are the results of inputting 1) through 4).
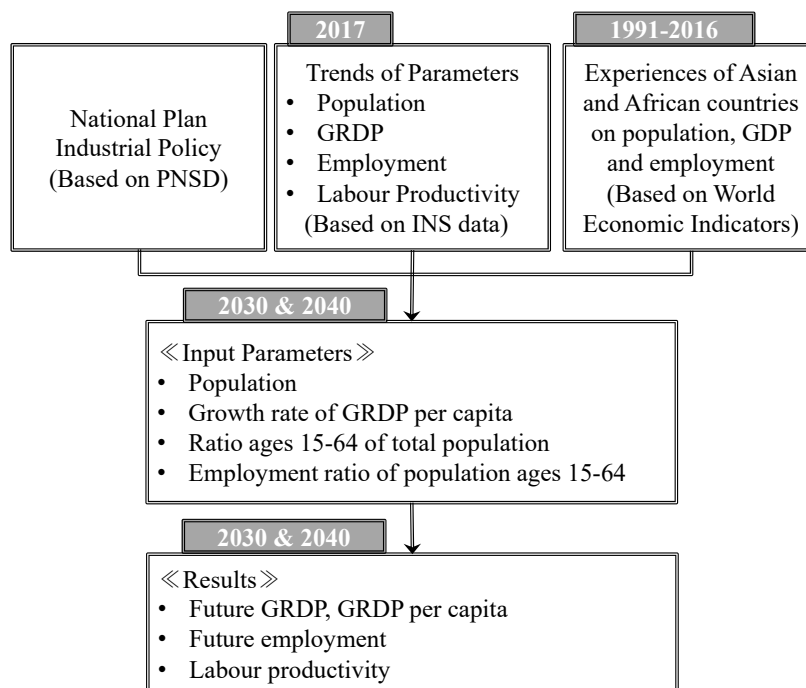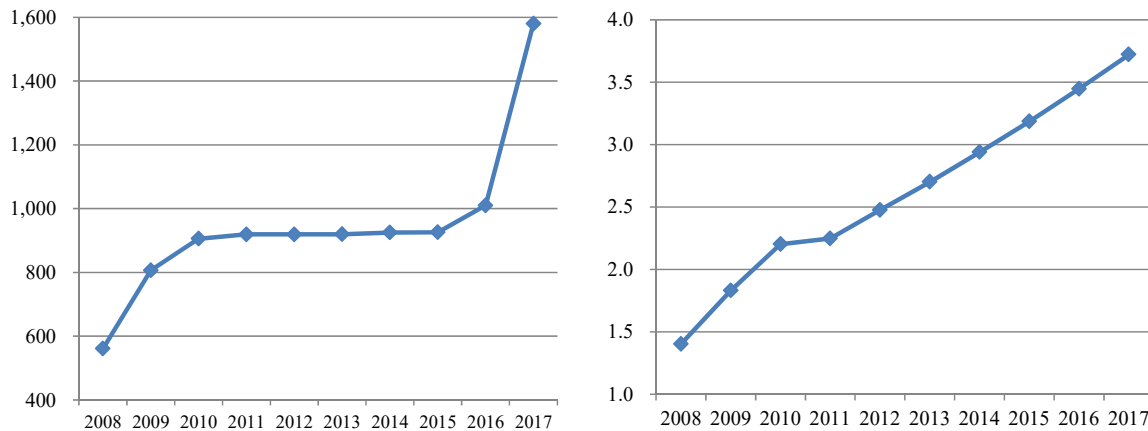

Source: The Study Team

Figure 5.2.1   Flow of Developing the Socio-economic Framework

(2)   Challenges in Projection

The pressures on currency depreciation and inflation are the significant challenges in projecting the socio-economic framework in USD terms. Some statistical data of Kinshasa City as well as DRC published by INS are announced in CDF (Congo Franc), therefore, the fluctuation of the exchange rate between USD and CDF will impact the projection by denominating in USD.

Figure 5.2.2 shows that the exchange rate (USD/CDF) has depreciated from 1USD = 468CDF in 2006 to 1,580 CDF in 2017; and the GDP deflator, a measure of price inflation with respect to the ratio of current GDP to constant GDP, shows 2.6 times of inflation for the past ten years.

Source: The Central Bank of Congo (BCC)

Figure 5.2.2　Exchange Rate (USD/CDF) (Left) and GDP Deflator (2006=1) (Right)

The Study Team has set the exchange rate of 1USD = 1,580 CDF as the constant 2017 price; however, the rate may need to be revised to follow the current status if currency depreciation further proceeds.

5.2.2　References of Asian and African Countries' Experiences

Before making a projection of GDP and employment in Kinshasa City, the past performances of Asian and African countries were examined to seek the development trends of the socio-economic parameters. References such as 1) GDP per capita growth rate, 2) GDP and employment composition by sector and 3) consumption pattern have been analysed in this section.

(1)　Reference 1: Growth Rate GDP per Capita

Six Asian countries (Indonesia, South Korea, Thailand, Malaysia, Philippines and Vietnam) and six African countries (DRC, Ghana, Uganda, South Africa, Tanzania and Kenya) have been selected as references of GDP per capita growth rate. The trends of GDP per capita growth rate show that Asian countries have achieved higher GDP per capita growth rate than African countries. The average growth rate of Asian countries is 3.8%, while the rate of African countries is 1.34%.

The trends of Asian countries show that they recorded negative growth during the Asian Financial Crisis in 1997 and the Global Financial Crisis in 2008, while the growth trends of African countries do not show any linkages among the selected countries. The figures show that achieving double digit growth is challenging. South Korea achieved 10.5% growth in 1999 immediately after the Asian Financial Crisis turning from the negative 6.2% growth in 1998, but other selected countries could not achieve double digit growth rate during the same period.
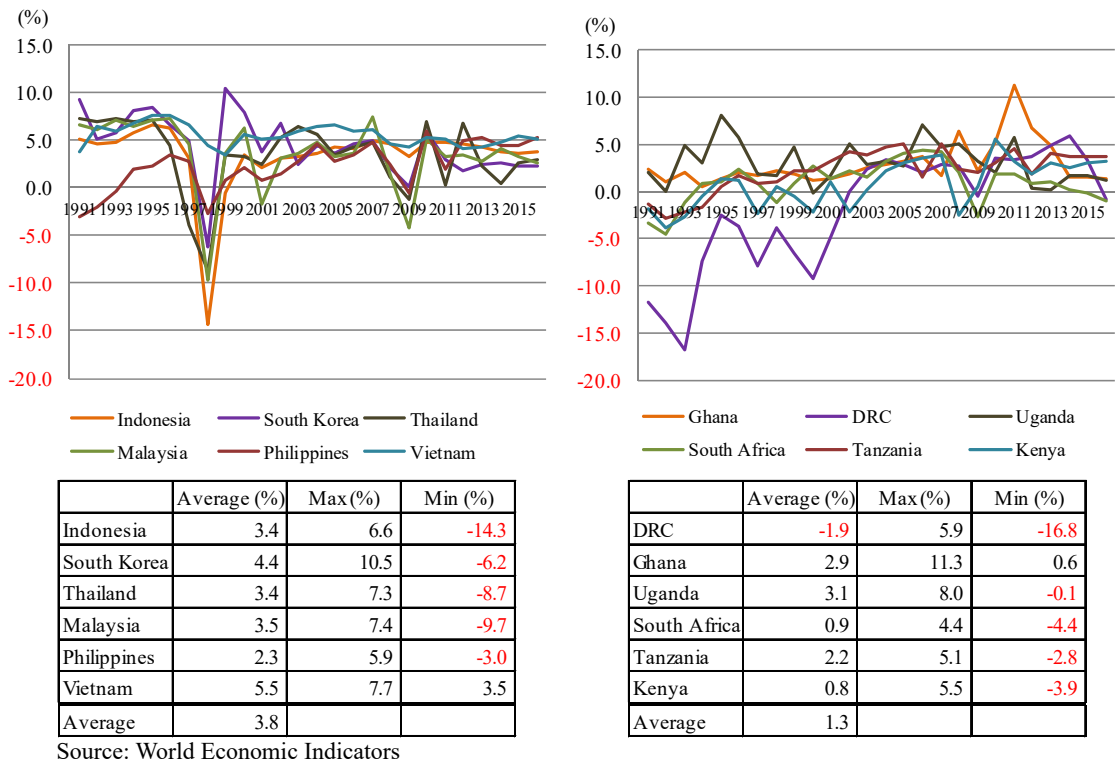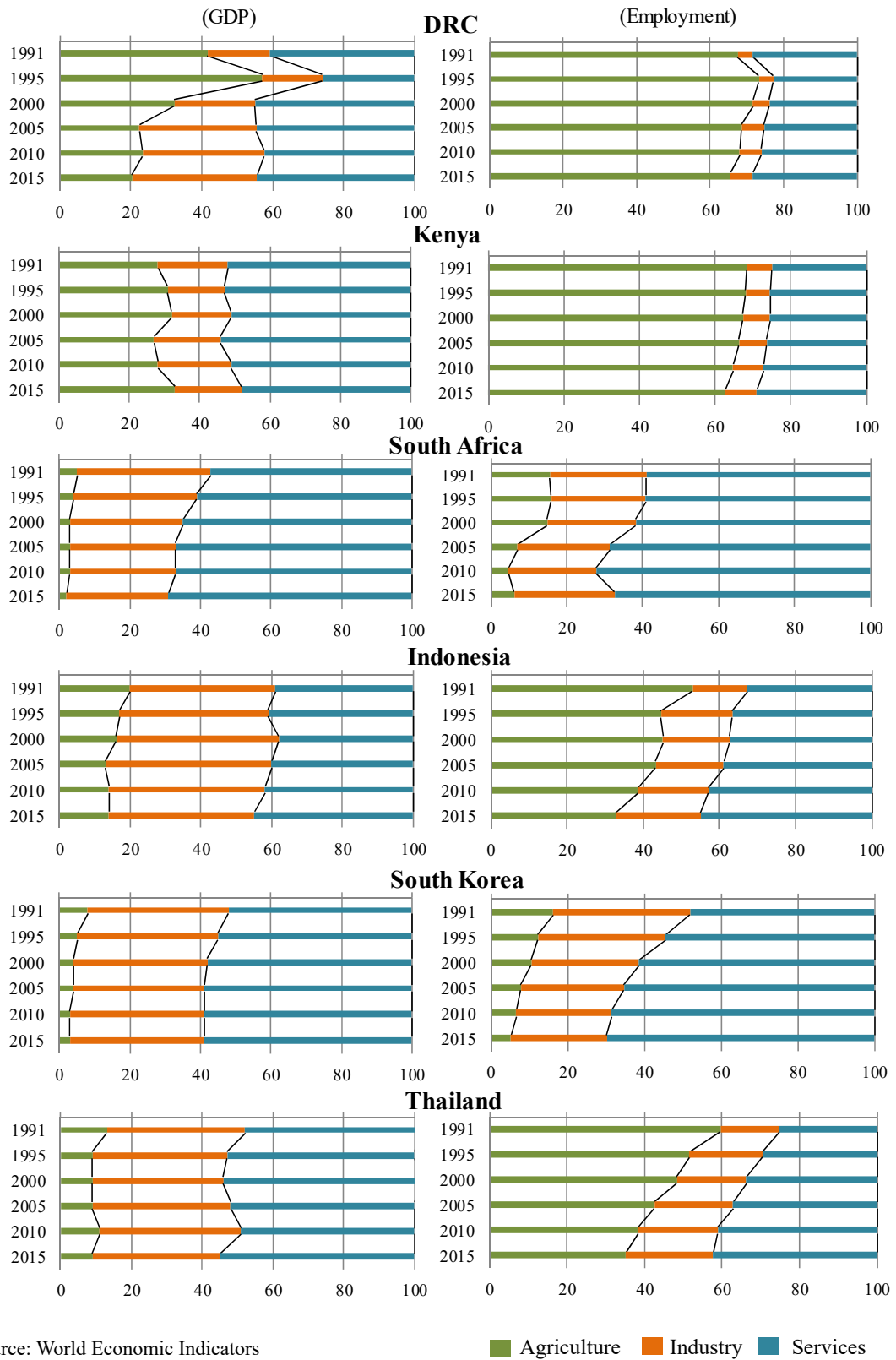
	Average (%)	Max (%)	Min (%)
Indonesia	3.4	6.6	-14.3
South Korea	4.4	10.5	-6.2
Thailand	3.4	7.3	-8.7
Malaysia	3.5	7.4	-9.7
Philippines	2.3	5.9	-3.0
Vietnam	5.5	7.7	3.5
Average	3.8		

	Average (%)	Max (%)	Min (%)
DRC	-1.9	5.9	-16.8
Ghana	2.9	11.3	0.6
Uganda	3.1	8.0	-0.1
South Africa	0.9	4.4	-4.4
Tanzania	2.2	5.1	-2.8
Kenya	0.8	5.5	-3.9
Average	1.3		

Source: World Economic Indicators

Figure 5.2.3   Growth Rate of GDP per Capita in Countries in Asia (left) and Africa (right) (1991-2016)

(2)   Reference 2: GDP and Employment Composition by Sector

Figure 5.2.4 shows the GDP and employment composition by sector for the past 25 years (1991-2015) in the selected countries (DRC, Kenya, South Africa in Africa; and Indonesia, South Korea and Thailand in Asia).

Globally, the share of manufacturing in total output tends to rise until countries reach upper-middle income status, and then declines as services become more prevalent at higher incomes (Economic Report on Africa 2017: Urbanization and Industrialization, United Nations Economic Commission for Africa). The figure indicates that the share of industry and services sector increases over the years, while the share of agriculture decreases.

The employment composition by sector also shows the increasing share in industry and services sector, and decreasing share in agriculture sector in South Africa, Indonesia, South Korea and Thailand. On the other hand, the employment composition by sector did not change significantly over the period in DRC and Kenya. While the share of agriculture in GDP decreases, the employment share remains constant; which indicates that the labour productivity of agriculture sector decreases in comparison with other sectors such as industry and services.

Figure 5.2.4   GDP (left) and Employment (right) Composition by Sector (1991-2015)

(3)   Reference 3: Consumption Pattern, 2010

Figure 5.2.5 shows the household consumption patterns in selected countries in 2010. The data is based on the national household surveys, collecting information for a group of household representatives of the entire country.

The figure indicates that "Food and Beverages", the most basic consumption in household, dominates 70% of the total consumption in DRC where the GDP per capita recorded USD 318 in 2010, while they constitute only 15% in South Africa, where the GDP per capita recorded USD 7,363. As for "Transport", it is only 3% in DRC and 8% in Kenya, but it is 11% in Thailand and 18% in South Africa.

This shows that the consumption pattern is diversified as the GDP per capita grows. Therefore, as the economy of DRC grows, people will start purchasing private cars or using public transport, transferred from non-motorized transport. Thus examining the car purchasing power of citizens through the level of GDP per capita is necessary to predict the impacts on future modal changes in transport means and transport network.
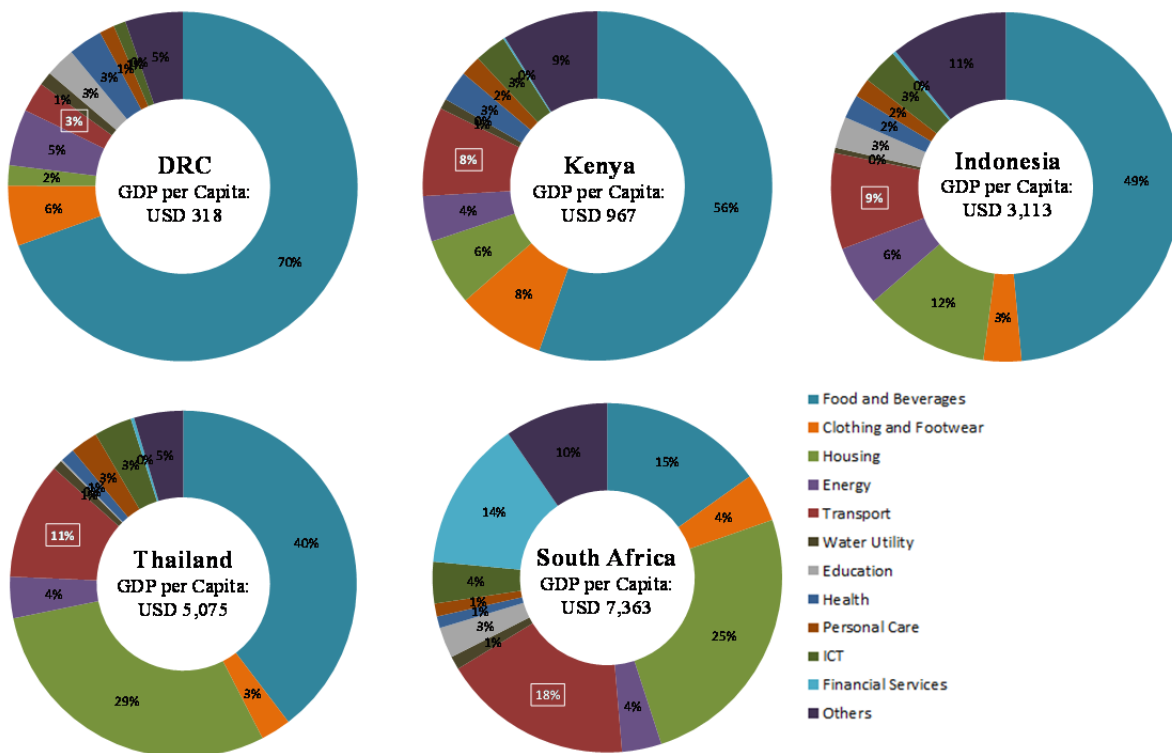
Source: Global Consumption Database

Figure 5.2.5   Consumption Patterns in Selected Countries (2010)

5.2.3 Review of the PNSD Scenario

(1) Outline of PNSD Scenario

The DRC government is in the process of finalizing the PNSD (*Plan National Stratégique de Développement* / National Strategic Development Plan) for 2017 to 2021, and the national vision for the economic development by 2030.

Table 5.2.1 shows the economic target and focus presented in PNSD. The government has a vision to transform the county into a middle income country by 2021, emerging country by 2030 and developed country by 2050, through achieving the targets of GDP per capita.

Table 5.2.1   Economic Target and Focus

Year	Target: GDP per Capita	Country Status	Focus Strategy
2015	USD 520		
2021	USD 1,036	Middle Income Country	Transformation of agriculture
2030	USD 4,000	Emerging Country	Intensive industrialization
2050	USD 12,000	Developed Country	Build a knowledge society

Source: PNSD

For achieving the goal of high economic growth, the PNSD has set the economic target indicators and action plans for the primary, secondary and tertiary sectors as shown in Table 5.2.2.

Table 5.2.2   Economic Target and Action Plan by Sector

Economic Target	Action Plan by Sector
• Achieving the status of middle-income countries by 2021, reaching the GDP per capita of USD 1,050. • Achieving the status of emerging countries by 2030, reaching the GDP per capita of USD 4,000. • Joining the club of developed countries by 2050, bringing the GDP per capita of USD 12,000	• (Primary) Agriculture transformation; Increase agricultural productivity, and Develop agro-industrial parks (PAIs) and integrated development centres (CDIs) to attract capital investment in the agricultural sector • (Secondary) Intensive industrialization of the country; Create more locally added values and develop vertical and horizontal relationships, Establish industrial parks (PIs) in the country • (Tertiary) Build knowledge society by investing in human capital accumulation and research & development; Build a set of science and technology parks (PSTs)

Source: PNSD

(2) Review of the PNSD Scenario

The above target figures have been applied to the socio-economic framework for this Study in assuming GDP per capita ether in DRC or Kinshasa City to be the same. The exchange rate of 1USD = 1,580CDF as the constant price of 2017 has been applied without inflation factors.

Table 5.2.3 summarises the results of the socio-economic framework based on the PNSD scenario.

Table 5.2.3   Socio-Economic Framework Based on the PNSD Scenario

	2017	2030	2040	CAGR (2017-2030)	CAGR (2030-2040)
Population of Kinshasa City (thousand)	12,505	20,000	26,000	3.7%	2.7%
GRDP per capita (constant 2017 USD)	597	4,000	6,928	14.0%	5.7%
GRDP (constant 2017 million USD)	7,463	80,000	180,124	20.0%	8.5%
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	16,354	27,168	15.3%	5.2%

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

Source: The Study Team

The inputs and results based on the PNSD scenario are summarised as follows:

a) Inputs

- Population of Kinshasa City: Estimation by the Study Team; 20 million in 2030 and 26 million in 2040

- GRDP per capita (constant 2017 USD): The GRDP per capita in 2040 (USD 6,928) is interpreted to be between USD 4,000 in 2030 and USD 12,000 in 2050.

- Ratio Ages 15-64 of Total Population (%): the ratio of working age population (age between 15 and 64) to total population is estimated to increase in response to the population structural changes. It is estimated to reach 50% in 2040.

- Employment Ratio of Population Ages 15-64 (%): the ratio of working age population to total employment is also estimated to increase as the employment opportunity increases. It is estimated to reach 51% in 2040.

b) Results

- GRDP per capita growth rate: a CAGR of 14.0% till 2030 and of 5.7% till 2040 has been calculated; however, as shown in the experiences in other countries, it is markedly difficult to achieve double digit growth except immediately after a depression.

- GRDP growth rate: a CAGR of 20.0% till 2030 and 8.5% till 2040 has been calculated.

- Labour productivity growth rate: a CAGR of 15.3% till 2030 and 5.2% till 2040 has been calculated.

c) Evaluation

- The Study Team recommends that the figures of the PNSD scenario be adjusted to follow the

past trends of Kinshasa City as well as experiences in other countries.

5.2.4 Scenario Settings

Even with the availability of the PNSD scenario, the Study Team has assumed their own scenario settings that realistically reflect the past trends in Kinshasa City as well as experiences in Asian and African countries. The high growth and low growth scenarios are set as follows.

(1) High Growth Scenario

The high growth scenario is summarised in Table 5.2.4.

Table 5.2.4 Socio-Economic Framework of High Growth Scenario (Recommended)

	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%

Source: The Study Team

a) Input

- Population of Kinshasa City: estimation by Study Team; 20 million in 2030 and 26 million in 2040

- GRDP per capita growth rate (constant 2017 USD): the rate of 3.8% has been applied based on the experiences in Asian countries (refer to Figure 5.2.3).

- Ratio Ages 15-64 of Total Population (%): the ratio of working age population (age between 15 and 64) in total population is estimated to increase in response to the population structural changes. It is estimated to reach 50% in 2040.

- Employment Ratio of Population Ages 15-64 (%): the ratio of working age population in total employment is also estimated to increase as the employment opportunity increases. It is estimated to reach 51% in 2040.

b) Results

- GRDP per capita: USD 964 in 2030 and USD 1,395 in 2040 has been calculated. It would reach almost USD 1,000 in 2030.

- GRDP: USD 19,285 million in 2030 and USD 36,263 million in 2040

- Labour productivity growth rate: CAGR of 3.3% throughout the projection period has been achieved.

c) Evaluation

- The Study Team recommends the High Growth Scenario, as it aims to achieve the high growth that has been performed in Asian countries.

(2) Low Growth Scenario

The Low Growth Scenario is summarised in Table 5.2.5.

Table 5.2.5 Socio-Economic Framework of Scenario Setting 2

	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	700	792	1.2%	1.2%
GRDP (constant 2017 million USD)	7,463	14,009	20,600	5.0%	3.9%
Population Ages 15-64 (thousand)	5,877	9,400	12,220		
Ratio Ages 15-64 of Total Population (%)	47%	47%	47%		
Employment (thousand)	2,838	4,538	5,900	3.7%	2.7%
Employment Ratio of Population Ages 15-64 (%)	48%	48%	48%		
Labour Productivity (USD/person)	2,630	3,087	3,492	1.2%	1.2%

Source: The Study Team

a) Input

- Population of Kinshasa City: estimation by Study Team; 20 million in 2030 and 26 million in 2040

- GRDP per capita growth rate (constant 2017 USD): the rate of 1.24% has been applied based on the experiences in African countries (refer to Figure 5.2.3)

- Ratio Ages 15-64 of Total Population (%): remain at the same rate of 47% throughout the period

- Ratio Ages 15-64 of Total Employment (%): remain at the same rate of 48% throughout the period

b) Results

- GRDP per capita: USD 700 in 2030 and USD 792 in 2040 has been calculated. It would not reach USD 1,000.

- GRDP total: USD 14,009 million in 2030 and USD 20,600 million in 2040

- Labour productivity growth rate: CAGR of 1.24% throughout the projection period has been achieved.

c) Evaluation

- The Study Team would not recommend the Low Growth Scenario, as the GRDP per capita would not reach at USD 1,000 until 2040, which achieve even the level of middle income country targeted for 2021 by the PNSD.

5.2.5 Recommendation of Socio-economic Framework of Kinshasa City

As examined above, the Study Team would recommend the High Growth Scenario as the socio-economic framework of Kinshasa City (Table 5.2.4).

5.3 Kinshasa City and its Macro Economics and Social Role

5.3.1 Assessment and Indication to Future

Kinshasa City, with its geo-strategic location, has been assuming key roles in the country and also in the region. It has grown to have over 12.5 million people in 2017 with a recent population growth rate of over 4.7% since 2005, and its high concentration in the central districts with some Communes over 500 population/km^2 density, out of the total surface of 9,985km^2. Based on those figures, Kinshasa City, its role and function, is characterized as follows.

(1) Kinshasa City - a City of Consumption -> Agro-Industrial Park

Kinshasa City is a metropole for consumption and distribution. Being the capital city of the country with over 11 million, Kinshasa City assumes the role as a city of consumption. It assumes the role of a Logistic Hub not only as a national but also as an inter-regional perspective.

The government under its PNSD / PNDIT plans, however, plans to bring eight growth poles and twenty agro-industrial parks and several SEZs (Special Economic Zones), one of which is the Matadi / Boma-Kinshasa-Kikwit corridor to bring industry, agriculture and markets. It is expected to include Maluku SEZ where industries, agro-food industries and construction materials are expected.

(2) Kinshasa City – Limited as a City of Production -> BOP (Bottom of the Pyramid) Cluster

For Kinshasa City, despite its concentration of population, industrialization has been rather limited. In the past, it was envisaged to provide and invite foreign capital to invest in the Kinshasa City area but development was limited due to the deteriorating investment climate due mainly to the internal conflict in the country.

Historically starting from the western part of the city, the current industrial areas within Kinshasa City are spread mainly in the central part of the city. They are the Gombe Port and Limete via Barumbu, along Congo-Japan Boulevard, which are the main concentration of industrial activities. Some of the names cited in SOSAK are:

- Central Area in Kinshasa City

  – Brewing - BraCongo (Limete), Bralima (Barumbu)
  – Textile - CongoTex (Ngaliema)
  – Metal - Chanimetal (Ngaliema)
  – Oil Stocking – SEP Congo, Shell etc. (Masina)
  – Slaughtering - City Slaughter House (Masina)

- Eastern Area in Kinshasa City

  – Steel - Complex Steel (Maluku)
  – Agro-industry - DAIPN, for urban agriculture

(3) Kinshasa City – BOP market driven Cluster Development -> BOP Business Environment

The country is one of the low income countries and does not have much industrial base and depth.

The notion of the BOP has been raised and developed by addressing USD2.5/day range of people so that the wants of the people can be well captured and satisfied in accordance with their life style.

Microcredit - One example of "bottom of the pyramid" is the growing microcredit market. With technology being steadily cheaper and more ubiquitous, it is becoming economically efficient to "lend tiny amounts of money to people with even tinier assets". The microfinance network helps the poor and allows banks to 'increase their business.

Market-specific products - One of many examples of products that are designed with needs of the very poor in mind is that of a shampoo that works best with cold water and is sold in small packets to reduce barriers of upfront costs for the poor. Such a product is marketed.

Innovation in the BOP - BOP market is very eager to adopt new innovations. For instance, BOP consumers are using PC kiosks, mobile phones, mobile banking etc., to significantly influence the adoption of an innovation in the bottom of the pyramid market.

(4) Kinshasa City – Limited Value Chain -> Value Chain

The country's Value Chain is very limited and does not promote strong job creation and rapid poverty reduction. A very small number of enterprises concentrated in Kinshasa City (UNDP / United Nations Development Programme) among which 9,000 of which 80% SMEs (Small and Medium-sized Enterprises). Limited number of companies requiring good value chain. So far, industries nearby Kinshasa City are: Brewery, Textile, Metal, Oil Stocking, Steel, and Agro-industry (PDNIT(Integrated National Transport Master Plan)). Agricultural products mainly brought to the City Centre by a number of wholesalers connecting to the original producing areas are gradually moving to city centres.

With a view to make economic development, a stand-alone type industry may have a limited scope of expansion. Like a case of the automotive industry, for an assembly car manufacturer, over 10,000 auto-parts companies are supplying automobile parts and related logistic transportation companies engaged in for auto-parts as well as labour force transportation. The same goes for the electrical appliance industries as well. Manufacturers of electric fans, rice cookers to washing machines, TV sets, they need to have around 50-100 parts makers to supply

their goods to the assemblers.

(5)   Kinshasa City – High Level of Unemployment and Low Labour Quality -> TVET (Technical and Vocational Education Training)

Kinshasa City has traditionally adopted an inclusive policy on inflow population but it is not well implemented due to the recent development of the accumulation of IDP (Internally Displaced People) from the east triggered by the internal conflict. Because of this high level of population in-flow, a high unemployment rate of 15.0% exists, higher than the national rate (3.7%), which affects young people aged 15-24 years (29.5%).

It also has its function as a centre for education in an academic system where most of the tertiary education establishments are located, though the quality of education stays rather low.

The quality of labour is due to its limited higher education mainly geared for public services and not to encouraging entrepreneurship or technical skills, or the poor facilities and quality of TVET schools. OJT (On-the-Job-Training), due to the limited variety of industries and services, has not been well incorporated yet. There seem some mismatches with the labour supply not meeting with employment needs.

(6)   Kinshasa City – de facto Land Locked Country/City-> Land Lock turnaround

Kinshasa City, located over 350km from Matadi that is one of the major ports in DRC, can be defined as a land locked city due to the natural hazard in between Kinshasa City and the Atlantic Ocean. Due mainly to those a mass volume of merchandise transportation cannot be done through the River Congo to downstream. The main export items of the country, e.g. copper, cobalt and gold, are produced in the Eastern Region directly exported via bordering countries in the east. Timber, as an exception, is transported via roads to the river network from north, the main forest areas, to Kinshasa City to be unloaded. Then loaded trucks and transported to Matadi, an exporting port.

Many land-locked countries exist where no access to seaports have been a big stumbling block, but this remoteness to the seaport for export and import for merchandise have helped some countries to consider intangible exportable or transferrable goods. Some labour intensive Internet based operation centres or technology using ample traffic of the Internet have served in some countries for their economic and social development.

(7)   Kinshasa City – in Need of Regaining its Role-> City Image into Art & Culture

Kinshasa City is undeniably a megalopolis but it must regain a role of metropolis by improving its image and recovering its position on the international scene that has been damaged or deteriorated during the course of the internal conflict and uncertainty (SOSAK).

SOSAK indicated new eight orientations. Some extracts are:

- 3. Decongest the city centre and offer other centres of activities and specialized and equipped shops;
- 4. Anticipating city extensions by regaining control over development procedures;
- 7. Reconciling the city with its Natural Environment and its past: the river, the streams, the

hills;

- 8. Promoting Kinshasa City nationally and internationally: City of Art and Culture

Having cited those, however, SOSAK also points out some constraints and obstacles. They are:

- Concentration of economic activities and little availability of specific sites;

- Difficulties in gaining access to electricity outside the city centre;

- Severe international, national and difficult internal displacement within the city, leading to increased costs;

- Insecurity of land and, more generally, of the business climate;

- Declining port activity (tonnage divided by 16 since 1980);

- Limete industrial areas in the process of being transformed into high-quality housing;

- International influence too low in comparison with the size of the city, and an overall negative image

(8) Kinshasa City – Planned Developments to the East -> New Regional Function Logistic / Road Station

SOSAK further discusses of an opening of approximately 300 km^2 of urbanization, an expansion to the east to join with Maluku by creating a mesh of primary and roads with a total length of about 604 km; Establishment of a high-capacity public transport system, and construction of a large-scale facility to provide better services to the population and raise the profile of Kinshasa City.

(9) Kinshasa City – Inland Port Function

SOSAK also indicated an inland port characterized by the transfer of raw materials to the metropolis.

The port will assume roles on passage and consumption as a place of accumulation, or storage function, commercial function, industrialization function and regional function among others.

5.3.2 Possible Orientation

(1) Introductory Views by SOSAK, PNSD and PDNIT

One can highlight some of the New 8 Orientations extracted from SOSAK as mentioned in 5.3.1. They are:

3. **Decongest the city centre** and offer other centres of activities and **specialized and equipped shops**;
4. Anticipating city extensions by **regaining control** over development procedures;
7. Reconciling the city with its **Natural Environment** and its past: the river, the streams and the hills;
8. Promoting Kinshasa City nationally and internationally: **City of Art and Culture**

Having cited those, however, SOSAK also points out some constraints and obstacles. They are:

- Concentration of economic activities and little availability of specific sites;

- Difficulties in gaining access to electricity outside the city centre;

- Severe international, national and difficult internal displacement within the city, leading to increased costs;

- Insecurity of land and, more generally, of the business climate;

- Declining port activity (tonnage divided by 16 since 1980);

- Limete industrial area in the process of being transformed into high-quality housing;

- International influence too low in comparison with the size of the city, and an overall negative image

Kinshasa City is undeniably a megalopolis but it must regain a role of metropolis by improving its image and recovering its position on the international scene that have been damaged or deteriorated during the course of the internal conflict and uncertainty (SOSAK).

In order to recover and further improve the image of Kinshasa City, possible orientations for development are discussed as follows:

1) Kinshasa City – Planned Developments (SOSAK)

As for the planned developments in SOSAK, opening of approximately 300 km^2 of urbanization with expansion to the east to join with Maluku is cited. It includes a creation of a mesh of primary roads with a total length of about 604 km, the establishment of a high-capacity public transport system as well as construction of Large-Scale Facility to provide better services to the population and raise the profile of Kinshasa City.

2) Kinshasa City – Economic Function (SOSAK)

On the economic function, Kinshasa City, as an inland port characterized by the transfer of raw materials to the metropolis. Passage of traffic and consumption as a metropole, as a place of accumulation of storage function, commercial function, industrialization function and regional function found as an important role for Kinshasa City.

3) Kinshasa City – Encouraging Factors (SOSAK)

Some encouraging prospects (SOSAK, Extract) are the construction of the rail road bridge project at Maluku, the establishment of a Special Economic Zone in Maluku, improvement of the navigability conditions of the river, which should permit a resumption of traffic and the modernization and expansion of the terminal building and creation of a tertiary proximity, and investments in real estate.

4) DRC - Development Strategy (PNSD / PDNIT)

According to PNSD / PDNIT, key sectors for development under PNSD are: agriculture and the agro-food chain, forestry and timber processing and marketing industries, mining, buildings and building materials, tourism and hotels, and financial services.

In the same token, PDNIT cites as the main sectors of development such as the agriculture with high potential but largely underutilized with 80 million ha land of which only 10% cultivated. Major products are cassava, sugar cane, corn, rice, banana, plantain and coffee. Secondly, the agro-food industries, producing among the four main cities of DRC where Kinshasa City assumes 1/3, and other manufacturing such as cement, building materials, toiletry/personal care products and textiles has been growing in recent years.

5) DRC - Government Programs (PNSD & PDNIT)

Further, PNSD / PDNIT Strategies deal with the diversification of the economy by adapting a cluster strategy of the primary industry - agricultural production, petroleum, the secondary - agri-food, wood industry, petroleum products, and the tertiary - transport, marketing, financing.

Around six clusters are grouped into growth poles with eight Growth Poles, twenty PAI (*Parc Agro-Industriel/* Agro-Industrial Parks) and several SEZs in Matadi / Boma-Kinshasa-Kikwit corridor (industry, agriculture and markets), including Maluku SEZ (industry, agro-food industry, construction materials); and seven others.

The country's Value Chain is very limited and does not promote strong job creation and rapid poverty reduction. Thus PNSD/PDNIT appeal creation of PAIs and centres for integrated development. 7 PAIs planned of which one PAI at Nkundi.

6) Some Concrete Directions Learning from Best Practices

For further development to address the future orientation of Kinshasa City, the following eight areas are pre-identified. All of those have been practiced in other countries to accelerate their economic and social developments of cities. Some of them below could also be well applied to the future industrial strategies of Kinshasa City.

(2) TVET for Higher Quality Labour

Skills are vital for poverty reduction, economic recovery and sustainable development. As a consequence, policy attention to TVET is increasing worldwide. TVET comprises formal, non-formal and informal learning for the world of work. Young people, women and men learn knowledge and skills from basic to advanced levels across a wide range of institutional and work settings and in diverse socio-economic contexts. UNESCO leads the global debate by advocating for the rethinking of TVET to enhance its role in developing more equitable and sustainable societies, though it is apparent that a primary academic ability should be fostered in advance.

TVET has an important role to play in technology diffusion through its transfer of knowledge and skills. Rapid technological progress has had and continues to have significant implications for TVET.

Firstly, understanding and anticipating changes has become crucial for designing responsive TVET systems and, more broadly, effective skills policies. Secondly, the flexibility to adapt the supply of skills to the rapidly, and in some cases radically, changing needs in sectors such as information technology and the green economy has become a central feature of TVET systems. Thirdly, the skills requirements and qualifications demanded for job entry are rising. This reflects a need for not just a more knowledgeable and skilled workforce, but one that can adapt quickly to new emerging technologies in a cycle of continuous learning.

In Japan, parents and students traditionally place higher value on academic education compared to vocational education. Hence, vocational education is often considered a second option after university for students with lower grades and/or students from lower socio-economic backgrounds. Since the 1980s, the number of universities in Japan has grown dramatically, to almost 800. Enrolments have grown over that period. More recently, due to changes in industry and in the skills required for work, vocational education and training institutions, especially the specialized courses at professional training colleges ("senmon gakko") have been gaining in popularity. Enrolments in these courses are now growing after a period of continuous decline. Vocational schools are attracting not only senior secondary school graduates but also university graduates who were not successful in securing employment upon graduation.

(3)   Value Chain for more Integrated Production

The idea of the value chain is based on the process view of organizations, the idea of seeing a manufacturing or service organization as a system, made up of subsystems each with inputs, transformation processes and outputs.

Inputs, transformation processes, and outputs involve the acquisition and consumption of resources - money, labour, materials, equipment, buildings, land, administration and management, and it explains how value chain activities which are carried out determines costs and affects profits. Most organizations engage in hundreds of activities in the process of converting inputs to outputs, or simply in production. These activities can be classified generally as either primary or support activities that all businesses must undertake in some form.

The primary activities are:

- Inbound Logistics - involve relationships with suppliers and include all the activities required to receive, store, and disseminate inputs.

- Operations - are all the activities required to transform inputs into outputs (products and services).

- Outbound Logistics - include all the activities required to collect, store, and distribute the output.

- Marketing and Sales - activities inform buyers about products and services, induce buyers to purchase them, and facilitate their purchase.

- Service - includes all the activities required to keep the product or service working effectively for the buyer after it is sold and delivered.

The secondary activities are:

- Procurement - is the acquisition of inputs, or resources, for the firm.

- Human Resource management - consists of all activities involved in recruiting, hiring, training, developing, compensating and (if necessary) dismissing or laying off personnel.

- Technological Development - pertains to the equipment, hardware, software, procedures and technical knowledge brought to bear in the firm's transformation of inputs into outputs.

- Infrastructure - serves the company's needs and ties its various parts together, it consists of functions or departments such as accounting, legal, finance, planning, public affairs,

government relations, quality assurance and general management.

(4) Ways out and Turn-around from Land locked country

A landlocked state or landlocked country is a sovereign state entirely enclosed by land, or whose only coastlines lie on closed seas. There are currently 49 such countries. Being landlocked creates political and economic handicaps that access to the high seas avoids. For this reason, states large and small across history have striven to gain access to open waters, even at great expense in wealth, bloodshed, and political capital. The economic disadvantages of being landlocked can be highlighted that the export and import of tangible goods, particularly when they are bulky and heavy for any international trade activities as well as trans-shipment activities.

However, there are several cases where the landlocked countries have overcome those disadvantages and strive its economic development.

Switzerland is the first case of those landlocked countries but have managed to make full use of natural and pure air and clean water to be used of Swiss watch making matched together with its diligent citizens. The same applies for chocolate making. Though they need to import most of the ingredients such as cacao and sugar in particular, they have well established a global brand name and have been keeping as one of the major chocolate producing nations.

The second case of the same nature is applied to Luxembourg. With its very small surface surrounded by the Netherlands, Germany and France, the Grand Duchy was born as a political compromise and functioning as a tax heaven at the beginning and now more as the central location for financial service industries by housing more than 400 banks in the country. Due to the nature of the asset management services requiring rather a labour-intensive aspect, the country manage to encourage workers from other European countries engaged in this field.

The third example is, in fact, not a landlocked country but a sea-locked country. New Zealand, located in the Southern Pacific, is surrounded by the sea. Their closest neighbour, Australia, is located over 2,000km away. The country has been known traditionally for its timber and wool export. However, the government has put emphasis on the human capital development more geared into Information and Communication Technology since 1980s. As a result, many computer scientists, programmers, and more precisely computer graphics specialists were born. The Lord of the Rings was released in 2001 for the first time from Hollywood but one needs to pay due attention that the computer graphic scenes which were produced in New Zealand and the computer graphics products were sent to the United States by using the Internet.

The last landlocked country example is Mongolia. It is a country located in between China and Russia, and is one of the mineral rich countries around the world. Minerals such as coal, iron ore and copper represent more than 80% of Mongolia's exports, a proportion expected to eventually rise to 95%. Mining is continuing to rise as a major industry of Mongolia as evidenced by the number of Chinese, Russian and Canadian firms starting mining businesses in Mongolia.

(5) Aiming at a BOP Market Leading Country

Kinshasa City economy is still under the poverty line, due mainly to the continuous unrest and uncertainty of the country but thanks to the economic growth level, it has been reaching soon BOP level (USD1,500/ capita year)

BOP level will have soon reached, according to PDTK Team estimation, Kinshasa City GDP per capita to reach over USD 2,230 by Year 2030. Under the BOP markets, "Wants" of people will be growing and further some measures for future "Take-off" to be envisaged. This means, by introducing consumer oriented markets, shopping malls in facilitating and absorbing People's Wants, and also BOP market-based products to can also be exported and further developed.

Around 60% of the global population, about 4 billion, earns USD1,500/year (USD5/day). Those people are considered to have strong willingness to step-up their lives, seeking better quality of life where both public and private sector can develop the BOP market to support people hand-in-hand.

	2020	2030	2040
GDP per capita $	1,112.4	2,292.7	4,725.4
CAGR	7.5%	7.5%	7.5%
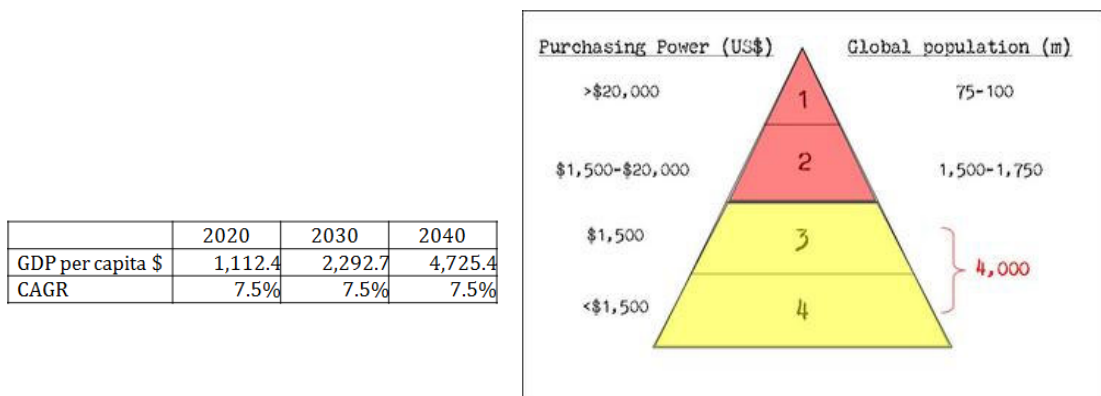
Source: The Study Team

Figure 5.3.1   Estimation of GDP per Capita and the BOP Model

Many initiatives and practices have been taking place.

Some of the cases are reverse innovation with simple and non-costly equipment from BOP countries to global markets. The cases are auto rickshaw from India to South East Asia, and simple tractors of India to North America. Indian Bajaj (Auto Rickshaw) have been exported to Asian countries since the 1980s. This is a product originally from India with three-wheels now shipped to Bangladesh, Thailand, Cambodia and Indonesia. The Indian Mahindra Motor tractors are sent to North America and Australia and have been a few years. This tractor product was originally licensed by an American company in 1960s but now with the Indian BOP goods, they have started to market a simple but easy to handle model to the US markets.

Manufacturing Industries in an African/Asian Style have been well developed in West Africa. Ghanaian Cars based on "Scrap and Build" in Kumasi, a central regional city and the former area of gold mining area, after the independence, where metallurgical and mechanical engineers began repairing machinery and then automobiles and motorcycles. Over 4, 000 workshops and retailers, have scrap cars and trucks, keep spare parts, and assemble parts into new cars and trucks. They now attract buyers not only from Ghana but also other West African countries.

The next examples are Fresh Flowers to Global Markets. The one is the fresh-cut flowers from Kenya to Europe. The Kenya Flower Council, formed in 1996, has been promoting its export to European and Asian markets including Japan. Quality and delivery management are crucial with close collaboration between importing and exporting partners.

(6) Roadside Stations with Community Inclusion

Public and passenger road transport stations (PDNIT) are proposed including bus stations for public and private passenger transport. Those exist both in Kinshasa City and in the provinces, but they are not administered.

A Roadside Station is a government-designated rest area found along roads and highways in Japan. In addition to providing places for travellers to rest, they are intended to promote local tourism and trade. Shops may sell local produce, snacks, souvenirs, and other goods. All roadside stations provide 24-hour access to parking, public toilets and facilities for sharing information. As of May 2016, there are 1093 Roadside Stations across Japan.

Construction of large-scale facility to provide better services to the population and raise the profile of Kinshasa City such as university hub, modern hospitals, urban markets, international wholesale markets, large conference centre, large cultural facilities, sport stadiums, cinema theatre complex, etc.

More combined/integrated approaches are appreciated for commercial/retail shopping complex with ample parking space and bus stops at long-distance bus/boat/train terminals with commercial facilities. In some cases, those facilities might generate opportunities for Public-Private Partnership (PPP) approaches by combining business opportunities.

(7) Agro-Industrial Park for Suburban Villages Effective Supply

Around six clusters are grouped into growth poles with eight Growth Poles, twenty PAIs and several SEZs in the Matadi/Boma-Kinshasa-Kikwit Corridor (industry, agriculture and markets), including Maluku SEZ (industry, agro-food industry, construction materials); and seven others.

Table 5.3.1   List of Agro-Industrial Parks

N*	TITLE OF PROJECTS	Province	COST in USD	DESIRED PARTNER	FUNDING	FEASIBILITY STUDIES
1	Agro-Industrial Park of Mushi-Pentane	Kwilu	280.000.000	PPP	No	Feasibility study available
2	Agro-Industrial Park of Bukanga Lonzo	Kwango	143.000.000	PPP	No	Feasibility study available
3	Agro-Industrial Park of Kinzau	Kongo-Central	25.861.114			Feasibility study available
4	Agro-Industrial Park of Lwiza	Kasaï Central	33.814.753	PPP	No	Feasibility study available
5	Agro-Industrial Park of Kindu	Maniema	To be determine	PPP	No	Feasibility study available
6	Agro-Industrial Park of Ruzizi au	Sud-Kivu	300.000.000			No info
7	Agro-Industrial Park of Businga (65.000 ha)	Equateur	No info			No info
8	Agro-Industrial Park of Lotokila (95.000 ha)	Prov. Oriental	2.293.891.293			No info
9	Agro-Industrial Park of Ngandajila (78000 ha)	Kasai-Oriental	951.801.000			No info
10	Agro-Industrial Park of Kanyama Kase (106.500 ha)	Katanga	1.077.464.000			No info
11	Agro-Industrial Park of Gbadolite (77.000 ha)	Equateur	1.599.990.750			No info
12	Agro-Industrial Park of Lowa (187.000)	Nord-Kivu	2.583.497.471			No info
13	Agro-Industrial Park of Turungu (39.000 ha)	Sud-Kivu	1.922.712.707			No info

Source: PNSD compiled by the Study Team

So far, as shown above, some PAIs have made its feasibility study but the implantation may take a while till they are materialized. The realization of the PAI depends on business climate, good governance, i.e. peace and stability at the conflict affected area. Currently the DRC has done many reforms creating a good environment for business. Two major changes have been noticed: the promulgation of a very incentive agricultural code and the enactment a very incentive decree on the strategic partnership on value chains.

The location and the geographic environment of each project is good especially when 80 % of the country is arable land with rivers and good climate allowing two harvest per year. The most important is good marketing from the Congolese Government in order to attract investors and implement profitable public private partnerships for each project.

(8) Logistics Park for Efficient transportation

A Logistics Park is a logistics organization which manages nodes with relative concentration of construction and development, with economic development nature of urban logistics functional areas. It also relies on related logistics services and facilities to reduce logistics costs and improve logistics efficiency and improve the flow of business services of processing, raw material procurement, to facilitate direct contact and consumption in production and other activities, with the economic function of the nature of industrial development zones.

Its outreach areas: logistics function as an urban zone, logistics park, including logistics centre, distribution centre, transportation hub facilities, transport organization and a management centre and logistics information centre, as well as to adapt to the operational needs of urban logistics management and logistics infrastructure; as economic functional areas, whose main role is to carry out to meet the urban consumer, the nearest production, regional production required by the organization of production and business activities of enterprises .

A Logistics Park is concentrated in the areas of logistics operations, in the convergence of several modes of transport; there will be a variety of different types of logistics facilities and logistics enterprise in the spaces focused on the layout of the facilities, but also at a certain scale and has a variety of services to facilitate the function of logistics enterprises in the assembly points. It includes eight features as an integrated function, intensive functions, information transaction capabilities, centralized storage and functions, distribution processing function, multimodal function, support service functions, and a parking feature. Among them, the contents of the comprehensive functions are the integration of logistics and logistics form the role of methods. It can be a comprehensive approach to storage, packing, handling, distribution processing, distribution and other practices and different practices between the conversions.

(9) Operation and Call Centres to Boost the Strategic Location

OC (Operation Centres) are implemented by business organizations, public utilities, universities, and government agencies that oversee complex networking environments that require high availability. OC personnel are responsible for monitoring one or many networks for certain conditions that may require special attention to avoid degraded service. Organizations may operate more than one OC, either to manage different networks or to provide geographic redundancy in the event of one site becoming unavailable.

Call centres are centralized offices used for receiving or transmitting a large volume of requests by telephone. An inbound call centre is operated by a company to administer incoming product support or information enquiries from consumers. Outbound call centres are operated for telemarketing, solicitation of charitable or political donations, debt collection and market research. A contact centre is a location for centralized handling of individual communications, including letters, faxes, live support software, social media, instant message, and e-mail.

A call centre has an open workspace for call centre agents, with work stations that include a computer for each agent, a telephone set/headset connected to a telecom switch, and one or more

supervisor stations. It can be independently operated or networked with additional centres, often linked to a corporate computer network, including mainframes, microcomputers and LANs. Increasingly, the voice and data pathways into the centre are linked through a set of new technologies called computer telephony integration.

Both Operation Centres and Call Centres can be located anywhere so long as a good Internet connection with data transfers are well secured. Often these services require labour intensive engagements by the part of operators. Relatively high command of the common communication languages is also essential.

The Philippines and India have been known well for those services due mainly to their English communication abilities. Furthermore, particularly for global business entities a 24 hour/7 days services are essential to offer seamless services. US financial institutions have been taking advantages of the time differences between the US continent and the Philippines. The UK headquartered agencies have been considering India as the best location for their Operation Centre activities.

One peculiar case can be found for Oman, a country located in the Arabian Peninsula. The country invites a substantial number of Indian Muslims as their workforce. They also have had a colony in East Africa called Zanzibar where the residents speak Swahili, a common language in Eastern Africa. Most of the people enjoy communicating in those four languages, i.e. Arabic, English, Hindi and Swahili. A Middle Eastern Airline company took advantage of their multi-lingual nature and set up a reservation centre.

(10) City of Art and Culture to Regain Images Globally

Art and culture encompass traditional culture, lifestyle culture, and a wide array of other elements. Art and Culture enrich people's minds, cultivate creativity and refined sensitivity, and provide people with the energy to face each and every day. While stirring our emotions, putting us at ease, soothing and comforting us, and moving us emotionally, culture and art also stimulate us through surprises and discoveries, and act as the sources of creative endeavours. Art and Culture can bring people together by encouraging shared thoughts and emotions that surpass barriers including time and national borders.

In recent years, connections between Art and Culture with other areas such as education, welfare, urban planning, tourism, MICE (Meeting, Incentive, Conversion and Event/Exhibition), and industry have drawn much attention. Here, MICE is an acronym for Meeting (corporate conferences), Incentive (corporate training and incentive travel), Convention (by international organizations and academic groups) and Event/Exhibition (including exhibitions and trade shows). It refers to business events that entail a large convergence of people.

In addition, Art and Culture possess the intangible power to attract numerous visitors to a city and influence society as a whole, and thus are considered to be important elements that add new appeal to local resources.

Excellent Art and Culture move people emotionally and give a city the appeal needed to attract large numbers of outsiders. The transmission of unique Art and Culture can help generate prosperity so that the city can become a centre for MICE-related tourism.

Basic Policies for a good Art and Culture are:

Basic Policy 1: Support citizen cultural and artistic activities in order to enrich citizens' lives

1) Promotion of cultural and artistic activities in pursuit of community vitalization

2) Support for cultural and artistic activities undertaken by citizens, NPOs (Non-profit Organization) and artists

Basic Policy 2: Cultivate and nourish children and other members of future generations

1) Create more culture and art experience activities for children

2) Discovery of, cultivation of and support for promising new artists

3) Cultivation of and support for human resources who contribute to culture and art

Basic Policy 3: Support artists and creators and carry out urban development that utilizes creativity

1) Promoting influx of artists and creators by supporting production, presentation/performance, and sojourns for artists and creators at the vicinity of creation bases while facilitating transformation of non-government buildings, warehouses and other structures into studios, artist workspaces, galleries and other necessary facilities, with the goal of increasing numbers of local artists and creators.

2) Network-building in connection with creative industries

3) Strengthening of artist and creator support functions

5.3.3 Supporting Government Policy and International Community Programs

In addition to the DRC government strategies such as SOSAK, PNSD or PDNIT, several international donor community members have been offering a wide variety of assistance.

(1) International Donor Community Support

Donor support by sectors can be summarized the information collected in 2012.

The most focused areas are Governance with 23% share, Health (22%) followed by Energy (16%), Infrastructure (13%) and Social Protection (11%). These allocations well reflected then the country's situation. On the infrastructure sector, the largest donor was the World Bank (31%), followed by the European Community (27%), AfDB (African Development Bank) (18%), and Belgium (12%).

By donors, their areas of focus are as follows.

- WBG (World Bank Group) FY2013-2016 CAS (Country Assistance Strategy)

  After terminating the former CAS, WBG has been preparing a new Country Partnership Framework for 2018-2021. FY2013 CAS faced challenges of stabilization and peace consolidation in the east and the regional integration as an opportunity to boost economic growth and create jobs by improving competitiveness to accelerate private sector-led growth and employment.

Table 5.3.2   DRC Donor Resources

DRC Donor Resources	Jul 2012		Infrastructure by Donors		
	USD m		World Bank	369	31.32
Agriculture	538	5.99	European Cmm	315	26.74
Governance	2,055	22.89	AfDB	214	18.17
Education	336	3.74	Belgium	138	11.71
Energy	1,456	16.22	DFID	70	5.94
Environment	452	5.04	Japan	66	5.60
Health	1,954	21.77	Canada	6	0.51
Infrastructure	1,178	13.12	Infra Total	1,178	100.00
SocProtection	1,007	11.22			
Total	8,976	100.00			

Source: The Study Team

- AfDB   FY2013 CSP (Country Strategy Paper)

  AfDB's FY2013 CSP aimed at natural resources and geo-strategic position to be more conducive to regional integration benefits, though not successful. They assessed that the agriculture, employing 70% of population and produces 40% of GDP shall be further developed, but also to take note that the fact that very small number of enterprises (9,000, of which 80% SMEs), concentrated in Kinshasa City and some in other urban centres. As for the development of infrastructure to support private investment and regional integration and capacity building of the State. During the course of dialogue of PDTK with AfDB, they stated to seek "a joint approach" and the Bank's transport/economic units.

- UNDP FY2017 POD (Priority of Development)

  UNDP FY2017 POD describes its development priorities 2017-2021 for the DRC, namely, stabilization / reconstruction of areas affected by conflict; accelerating economic diversification; development of economic infrastructure; development of the private sector and the financial sector, development of human resources, development of the provinces, and strengthening regional integration. UNDP also has fixed five focused sectors, which are agriculture, light industries, energy and hydrocarbons, services and infrastructure

  – Other donors are EU (European Union) / EDF (European Development Fund), focusing mainly on the fight against poverty, environment, and governance.

  – Belgium (CTB / Cooperation Technique Belge) has been working on the improvement of the quantity and quality of agricultural production, support in processing, storage and marketing activities, and also support for the opening up of production areas.

  – France (AFD / Agence Française de Développement) focus areas are, developing human capital and basic social services, development of natural resources and sustainable growth, and support for wealth creation and development of the financial system.

(2) DRC Road Fund - FONER

DRC Government has a fund dedicated for road finance sources called FONER (*Le Fonds National d'Entretien Routier de la République Démocratique du Congo*/National Road Maintenance Fund).

FONER is a public administrative and financial institution created by Law n ° 08/006-A of 7 July 2008. Fees charged on lubricants (CDF of USD 0.25 equivalent per litre) and Fuels (CDF of USD 0.10 per litre) on land. Those royalties generate 98% of the total resources of the FONER.

FONER has difficulty in verifying that charges are levied on all imported fuels, particularly some difficulties in mobilizing resources. FONER budget for 2016 is USD 128 million, whereas annual total requirements for road maintenance are estimated by the FONER at approximately USD 250 million, i.e. almost double its total resources. With a view to strengthen its financial ability, FONER has been considering to introduce "Vignette" system.

CHAPTER 6   Preferred Spatial Development Scenario

6.1   Land Availability and Urban Development Strategy

6.1.1   Balance between Development Demand and Supply of Land

For the examination of spatial development scenarios, the Study takes the following results on development demand and possible land supply.

(1)   Development Demand

Development demand in the future is estimated based on the estimated population in 2030 and 2040. In Sections 3.2.1 and 5.1.3, the estimated population of the Study Area is calculated as follows.

The future population of the Study Area is expected to be increased mostly in the communes in the periphery – Mont-ngafula, Kimbanseke, N'sele and Maluku - which have enough development land in its extension. In these communes, the population is expected to increase by approximately 5,317,000 from 2017 to 2030, and by 10,075,000 from 2017 to 2040 as shown in Table 6.1.1.

Table 6.1.1   Estimated Population of the New Development Area in the Periphery and the Study Area (ref. Section 5.1)

Year	Communes in the Periphery with New Development (*1)		Other areas		Total of the Study Area	
	Number of Population (*1)	Increase of Population from 2017	Number of Population	Increase of Population from 2017	Number of Population (*1)	Increase of Population from 2017
2017	3,394,000	-	8,046,000	-	11,441,000	-
2030	8,711,000	5,317,000	9,218,000	1,172,000	17,929,000	6,489,000
2040	13,469,000	10,075,000	9,539,000	1,493,000	23,008,000	11,568,000

Note: The number of estimated population is rounded off each amount to the nearest thousands.

*1: Mont-ngafula, Kimbanseke, N'sele, Maluku (only inside the Study Area)

Source: The Study Team

(2)   Supply of Land in Communes in the Periphery

The capacity of the candidate future development areas in the periphery communes are shown as follows. The Study assumes a population density of 300 pers/ha, in general based on existing new development area in sloping land within the extension area, and 200 pers/ha for Maluku as integrated development with agriculture.

According to the above mentioned assumptions, the capacity of the future development in communes along the periphery is about 12,382,000, as shown in Table 6.1.2. The area has capacity

to cover the estimated increase (i.e. 11,568,000 persons) in the corresponding communes.

Table 6.1.2   Development Capacity of the New Development Area in Communes

in the Periphery (ref. 5.3.1)

Commune	Future Development Area (ha)	Estimated Population Density (pers./ha)	Estimated Population Capacity of the Site
Mont-ngafula	10,235	300	3,071,000
Kimbanseke	4,251	300	1,275,000
N'sele	23,469	300	7,041,000
Maluku	4,977	200	995,000
Total	42,932	-	12,382,000

Note: The number of estimated population is rounded off to the nearest thousands.

Source: The Study Team

(3)   Study on Assumed Size of Business and Commercial area

1)   Issues of current business / commercial focal areas in Kinshasa

According to the social survey results on trip and business activities of the residents, the numbers of workers in business and commercial areas / communes are estimated as follows:

- Number of workers of the entire CBD (Central Business District) inside Gombe commune is estimated at 450,000; about 3.7% of whole population of Kinshasa City, and 560% of the number of residents (night-time population) of the Gombe commune.

- The working population (day-time population) in the surrounding communes[1] around the CBD is estimated to be about 25% to 60% of the total commune residents.

- Limete and Kinkole are valuable industrial focal zones of Kinshasa. The working population is estimated at about 150,000 in Limete and 100,000 in Kinkole.

- There are limited numbers of commercial, business and industrial focal zones in other communes. In these communes, small and medium sized businesses provide district level services. These markets and industrial areas are not well organized spatially as well as in their management and operation. About 4 to 20% of residents (night-time population) in those communes are estimated to be workers.

From the above mentioned working place situation, the following are pointed out as issues to be considered.

- Modernized business and commercial services are provided in a limited area in Kinshasa. These offices and facilities are located mostly in the CBD inside Gombe commune, and they offer job opportunities of only 3.7% of the whole population of Kinshasa.

- In addition to the above mentioned CBD area, modern industrial products and services can be offered in factories in the Limete industrial area. Considering urban expansion towards the eastern direction, the location of the modern industrial focal zone is spatially biased.

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[1] Barumbu, Kinshasa, Lingwala, Kasa-vubu, and Kintambo communes

- Limited working places of modernized industries accelerate unipolar concentration of working areas, resulting in traffic congestion during commutes.

2) Assumed working population size of future industrial zones

Corresponding to the increase of the Kinshasa population and urbanized areas, new industrial and business areas would be developed. Moreover, the capacity of the current CBD and industrial area is assumed to be increased through efficient land utilization by urban redevelopment and reconstruction of buildings. The assumed working population size is assumed as follows.

CBD area

Comparing CBD working population of Kinshasa with those of other countries, the ratio of employment in the CBD to employment in the metropolitan area as a the whole is about 18.5%, which is quite similar to other cases in the world as shown in Table 6.1.3. Considering population growth, urban space expansion, and industrial development in near future, the CBD working population is assumed to increase according to progresses of spatial redevelopments. Referring to other cities with about 5 million in employment, the ratio of working population in the CBD is about between 15% and 20%. This results in an estimation of employment of about 6.0 million in the Study Area in 2040. Based on these references, employment in the CBD could be considered to reach almost double of the current working population, with about a 1.0 million working population in the CBD, in 2040.

Table 6.1.3   Working population of CBDs, ratio to resident population and density

Country	Urban Area	Business District	Employment in Business District	Employment in Metropolitan Area	Business District Share of Employment	Year
Japan	Osaka-Kobe-Kyoto	Osaka Loop	1,380,000	7,500,000	18.4%	2001
S. Korea	Seoul	CBD	1,226,830	7,122,689	17.2%	1990
USA	Los Angeles	Freeway Loop+	310321	6,813,757	4.6%	1990
UK	London	CBD	1,260,500	6,000,000	21.0%	1998
France	Paris	CBD	1,025,000	5,109,107	20.1%	1990
Japan	Nagoya	Core CBD	510,000	4,000,000	12.8%	2001
DRC	Kinshasa	Gombe	450,000	2,400,000	18.5%	2017

Source: www.demographia.com --- Wendell Cox Consultancy

Based on the expansion of the urban area, Kinshasa City is expected to develop sub-centres in addition to the current CBD area (urban centre) in Gombe. The sub-centre supplements the urban function of Kinshasa City, especially for the areas far from the current CBD. The population of the eastern part of the city (N'sele and Maluku communes inside the Study Area) is estimated to reach 6.5 million in 2040, equivalent to about half of the current population of Kinshasa City. The Study also estimates that the sub-centre will accommodate a working population of about 200,000 in 2040, which is about half of the current working population in Gombe of about 450,000.

Industrial area

The current working population of the Limete commune is estimated to be about 150,000 based on the commuter survey result conducted by the Study. Table 6.1.4 shows the number of workers per planning unit in the case of industrial parks in Asia. According to this reference, 10,000 to 50,000 workers are assumed for the development of the planned industrial focal areas in the future.

Table 6.1.4   Working Population of Industrial Development

Type of industrial development	Size of working population per type of industry
Small device product factory	200 to 20,000
Electric assemble factory	1,000 to 30,000
Car manufacturing integrated industrial area	2,000 to 70,000
Industrial park	2,000 to 100,000

Source: The Study Team

District centre

Outside of the central urban area, about 10% of commune residents (night-time population) are estimated to be workers in the commune. These workers provide business and commercial services at the district and neighbourhood level. Some workers provide these services under informal or daily employment status. According to the progress of industrial development and their modernization, these workers' statuses are expected to be gradually formalized. In order to provide administration services, modern business and commercial services, integrated district centres will be developed. Assuming that 10% of residents work for these district centres and provide services for each commune, each district centre will accommodate about 30,000 to 50,000 workers for residential communes, and 100,000 to 170,000 workers for larger communes in the periphery.

6.1.2   Measures for Realization of Development Strategy

Reflecting the assumed development demand and supply, the Study examines the possibility of applying two different measures to realize the development strategies.

(1)   Induction of Development Area

SOSAK examined the selection of candidate development areas as the induction of development areas. However, this measure is considered difficult to be introduced effectively, for the following reasons.

- SOSAK assumes a lower increase ratio for its future population than the result of the INS (National Statistical Institute) and UN (United Nation) estimation.

- It examines candidate development areas and sets alternative development scenarios by selecting different development areas for the year 2030.

- Considering the updated INS and UN study on population increase, land availability, and actual progress of urbanization, the present as well as the future population in Kinshasa City was estimated by the Study to be higher than the estimation by SOSAK, which revealed that there are few places to select as the potential development areas in the Study Area in 2040.

- From the above mentioned results and situations in the long-term future of 2040, the selective induction of a development area cannot work as an effective measure to control future

development of the City.

- The resulting future land capacity in the periphery as presented in Table 6.1.1 shows the necessity to consider that all the development candidate areas will have to be developed to accept the increased populations in 2040, and that there will be no difference in the selection of development areas.

- From the comparison result of development demand and development supply, all candidate development areas are expected to be occupied in 2040. In other words, the candidate areas are not sufficient for development by 2040; all areas are target areas of future development.

(2) Induction of Urban Structure

Even if there is no choice but to select all of the available potential development areas in the Study Area in the future, the induction of a preferred urban structure should be pursued as the strategy of the realization of suitable future development in the Study Area. Corresponding to the expected situation on the development of the Study Area, the following matters should be considered for realizing the measures of the development.

- Strategic Implementation of Area Development:

  It is possible to promote development in certain desired areas by land use control according to the development master plan, for construction of infrastructure and provision of subsidies for development activities by the private sector. For the promotion of these developments, the master plan should specify basic land uses and an implementation program with a timeframe.

- Introduction of Urban Functions:

  The land use plan and regulations can be applied for the control of urban functions. Development and application of further detailed land use regulations and implementation of corresponding procedures enables a preferable urban structure. Also, investment of development by the government and/or PPP scheme (e.g. development on industrial areas, sub CBD will induce related developments around the target areas.

- Development with Construction of Roads:

  As area development such as industrial areas and commercial areas progresses, construction of urban infrastructure also induces related development. Especially in the Study Area, the construction of roads, water supply facilities, drainage facilities and power supply are indispensable for proper urban development. In particular, construction of roads is essential for the development of residential, commuting and industrial purposes.

These applicable inductive measures and expected outcomes are considered and emphasized in the consideration of the development scenarios in the following sections.

6.1.3   Urban Development Strategy

The urban development strategy of Kinshasa is formulated as an integrated solution to current urban issues, spatial and environmental constrains, and development possibilities, as explained below.

Most of the urban problems of Kinshasa are caused by an overconcentration of residents, workers and buildings. Eventually, it has brought about inappropriate living conditions such as poor sanitation and the malfunction of various urban facilities. To correspond to the increasing population and housing demand, additional urban developments in the current urban area further exacerbate an unsuitable living environment. In order to minimize the negative impacts of the current urbanization, future development areas and new urban functions should be properly dispersed, spatially and sustainably.

The future Kinshasa urban area can be divided into 3 divisions by two major rivers (N'dijili River and N'sele River) from the geographical point of view; the Western Division (Gombe, Mont-ngafula and Ngaliema), the Central Division (N'djili / Masina / N'sele / Kinkole) and the Eastern Division (Kimpoko / Maluku). For a balanced urban development, urban functions should be strategically introduced and decentralized into each division.
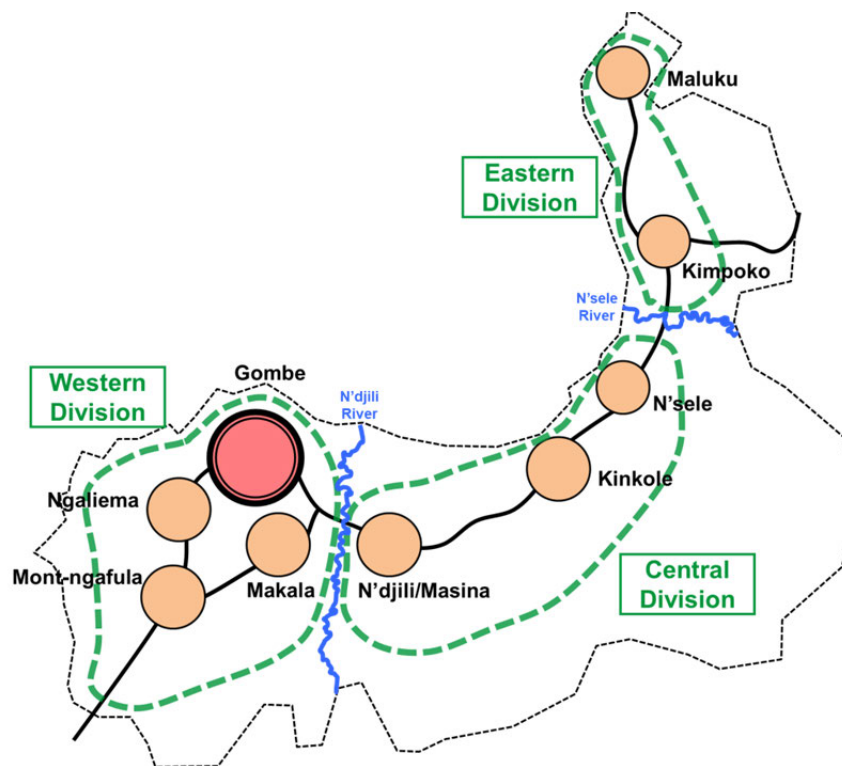
Source: The Study Team

Figure 6.1.1   Urban Divisions of Kinshasa

As a solution to integrate these divisions, a smooth linkage between them is important. These linkages should be strengthened by improving traffic networks. Particularly, enhancement of traffic flow along the East - West corridor, namely N1 Road, should be addressed first. Then, access to the East-West corridor should be either improved or newly constructed from current/new development areas inland.

As urbanization progresses, land for new housing and various facilities for urban functions are required. The available land for new urbanization has been confined rapidly. Therefore, an intensive use of limited available land and the formation of effective urban linkages are the key

strategies to realize the successive growth of Kinshasa City.

The linkage between the inside and outside of Kinshasa should be established simultaneously with the enhancement of the intra-city network, such as: construction of the new bridge between Kinshasa and Brazzaville; strengthening of traffic node function in Kimpoko; development of Kinkole as domestic water transportation bases; introduction of logistic functions at Kimwenza as a gateway into Kinshasa city from Matadi; and remote settlement area between agriculture areas in the southern part of Kimbanseke and N'sele. Construction of the Southern East-West corridor in the future should be planned to maximize development potentials of the southern Communes.

A strategy of urban development towards the east and the periphery of the existing urbanized area of Kinshasa is expected to help decrease the pressure on the current population density of the city centre area, as well as distribute urban functions to plural sub-centres and district centres. Promoting such an urban development strategy will encourage the viability to implement urban redevelopment projects planned for existing densely populated urban areas. Urban redevelopment needs to advance by securing land for public and social facilities, renewing urban infrastructure and functions, promoting effective use of land, and realizing balanced urban development.

6.2 Alternative Scenarios of Spatial Development

The following are three scenarios assumed to be alternative urban structures in 2040. The first is the prospect of no intervention of land use control and/or induction of development by public entities (Zero Option). The other two scenarios suggest countermeasures to address existing as well as future assumed urban problems.

6.2.1 Scenario 1: Urban Development without Active Control and Management (Zero Option)

The scenario without active control and management is defined as continuing the current urbanization trend.

As observed recently, changes in the urbanization of the Study Area is expanding spontaneously without proper infrastructure. As a nature of the recent development, urbanized areas are expected to grow from west to east along the N1 Road, with mixed land uses sprawling into the hinterland.

The construction of roads will follow the urbanization, but land for roads will not be secured in advance because of the absence of urban planning and development control. As a result, the land uses and building uses will be mixed throughout, which makes it difficult to introduce integrated urban and industrial functions that need adequate land and good access to business functions (e.g. large area for factories and offices).

As the result of the above mentioned spatial land use situation, the following difficulties are expected to emerge.
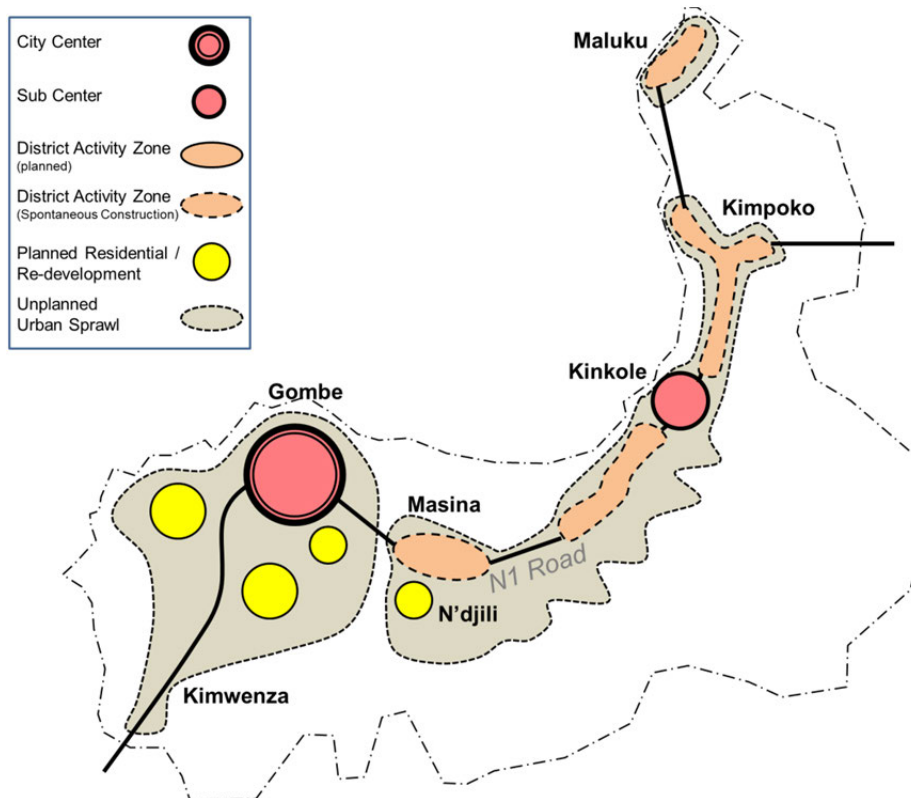
Source: The Study Team

Figure 6.2.1   Scenario 1: Expected Urban Structure without Active Control and Management (Zero Option)

- Problems of Structure of Urban Space

Under this scenario, it is difficult to expect regulated spatial developments except for such existing urbanized areas as Gombe and Kinkole. New industrial activities are expected to develop along the N1 Road and arterial roads in communes. Small- and medium-sized shops, workshops and factories would be constructed in and nearby existing rural villages in the future. It is difficult, however, to expect sufficient public spaces, facilities and infrastructure required in these areas, because of the limited availability of land. As a result, continuity of small local community markets, shops and ateliers along major streets form unplanned mixed uses of land and buildings without a clear spatial structure.

- Problems of East-West Movement

Under the Zero Option scenario, the urbanized area will expand along the N1 Road. As observed these days, small/medium-sized shops and industrial facilities will emerge along the existing arterial roads without adequate spatial planning. Moreover, the lack of planning areas for commercial, business and industrial activities will force residents to commute long distances to and from their work places.

Passenger and vehicular movements of both formal and informal economic activities provokes the concentration of east-west traffic along the limited route (currently, only the N1 Road satisfies this function). Traffic congestion is observed currently in N'djili and Masina communes, and it is envisaged that traffic in those areas will worsen as the urbanization

progresses in the future. In addition, an increase in population and social-economic activities in Kinshasa City will create a remarkable increase of traffic volume of passengers and cargoes. Without necessary counter actions by the government, such as construction of a new road network, the current road infrastructure will be oversaturated and paralyzed in the near future.

- Problems of North-South Movement

Recent urbanization in Kinshasa has been developing from the west to the east along the N1 Road, and is further penetrating into the southern hilly area of the city without accommodating appropriate access to the N1 Road. In order to access the CBD of Kinshasa City or other regions/provinces, it is necessary to reach the N1 Road (the Northern East-West corridor) first. New development is planned not only in the eastern Kinshasa, but also in the southern hilly area of Kinshasa. Therefore, traffic demand in the north-south direction will increase and inevitably require properly spaced north-south arterial roads connecting the southern hilly area and the Northern East-West corridor of the N1 Road.

6.2.2 Scenario 2: Distribution of Urban Functions along the N1 Road

This scenario proposes the distribution of urban function along the N1 Road as the main solution for the current issues of Kinshasa City.
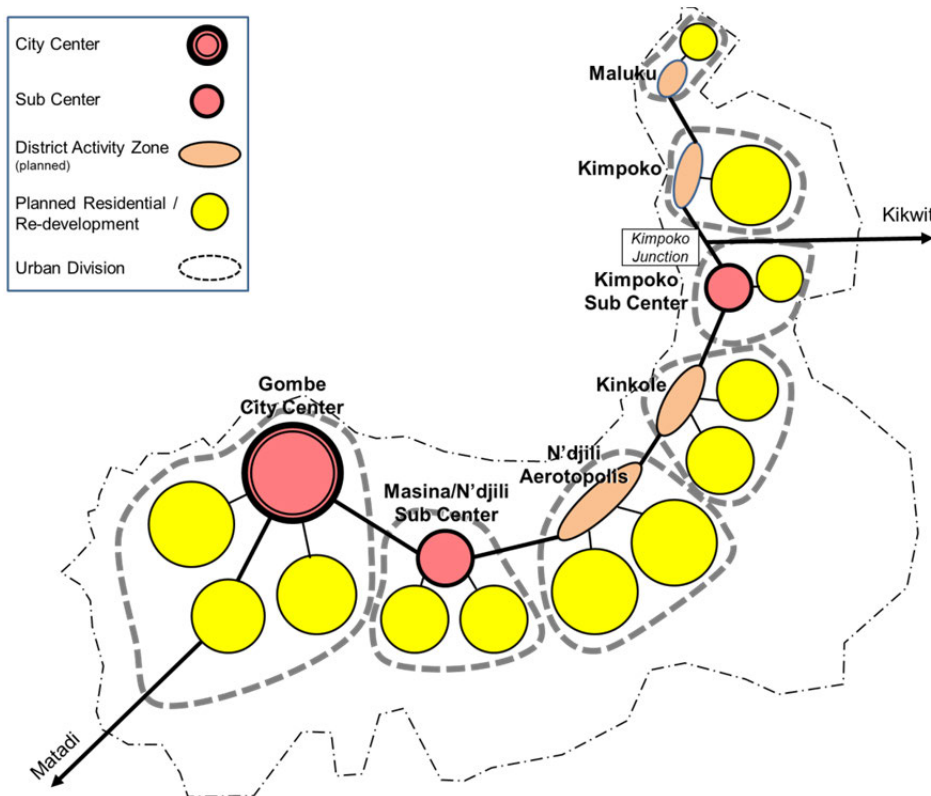
Source: The Study Team

Figure 6.2.2   Scenario 2: Expected Urban Structure with integrated developments along the N1 Road

- Spatial Solution

East-west traffic movements are expected to be reduced by the distribution of industrial, commercial and administrative cores along the current N1 Road and residential areas in its hinterland area. Currently, residents scattered over Kinshasa City take long commutes to limited working places like Gombe and Limete for instance, in order to seek formal job opportunities. Under the current development situation of Kinshasa City, it is difficult to expect spontaneous progress of a decentralization of industrial and commercial areas, resulting in the discursive sprawl of urban spaces without the preparation of suitable land for investment.

Strategic implementation of integrated development is expected for the decentralization of the functions of Kinshasa City and the dispersal of overcrowded urban traffic.

As for the distributed urban cores, the following areas are expected to be developed.

- N'djili Airport Industrial Development

  Near the N'djili Airport, there is potential for the development of integrated industrial areas with air logistic functions. Airport side industrial development is realized in many cities in the world.

- Kinkole Area Development

  Kinkole has been developed with a small port for domestic cargoes. Considering the importance of the cargo network of the DRC and the limited capacity of the current Kinshasa Port in Gombe, it is important to secure several sub-ports in other areas in the Study Area. Kinkole is one of candidates for this function.

- Development near the Kimpoko junction (Divergent to Maluku and Kikwit)

  The Kimpoko junction of Maluku Road and the N1 Road towards Kikwit functions as a gateway to Kinshasa City for the products from the eastern regions of Kinshasa City. Near the junction, a market with logistic and parking functions has been constructed and occupies space along the N1 Road. Integrated spatial planning is necessary in order to avoid further aggravation of the present traffic congestion along the N1 Road.

- Problems of Structure of Urban Space

  Aforementioned commercial and industrial activity zones should be planned along the current N1 Road and residential development be planned to cluster in the south of N1 Road. North-south arterial roads should be constructed to access activity zones along the N1 Road from the southern residential areas and planned not only to accommodate commuting services but also induce S&M scale and informal sector businesses. It is, therefore, very much likely that traffic on the access to the N1 Road will be heavily congested as the urbanization progresses to the south. Urban core functions could be dispersed as planned along the N1 Road and where formal sector business will be encouraged. Nevertheless, traffic condition on the current N1 Road will remain almost unchanged since commuter traffic between the south and formal work places still use the N1 Road, though an average commuting distance will be shortened compared to the Scenario 1, in addition to the inter-urban and inter-regional traffic which inevitably passes the current N1 Road.

6.2.3 Scenario 3: Development of Kinshasa Southern Growth Corridor (CCS-Kin) and Distribution of Urban Functions along the Corridor

Corresponding to the suggested issues and problems of Scenarios 1 and 2, Scenario 3 proposes further distribution of the functional areas in the spatial development in Kinshasa City.
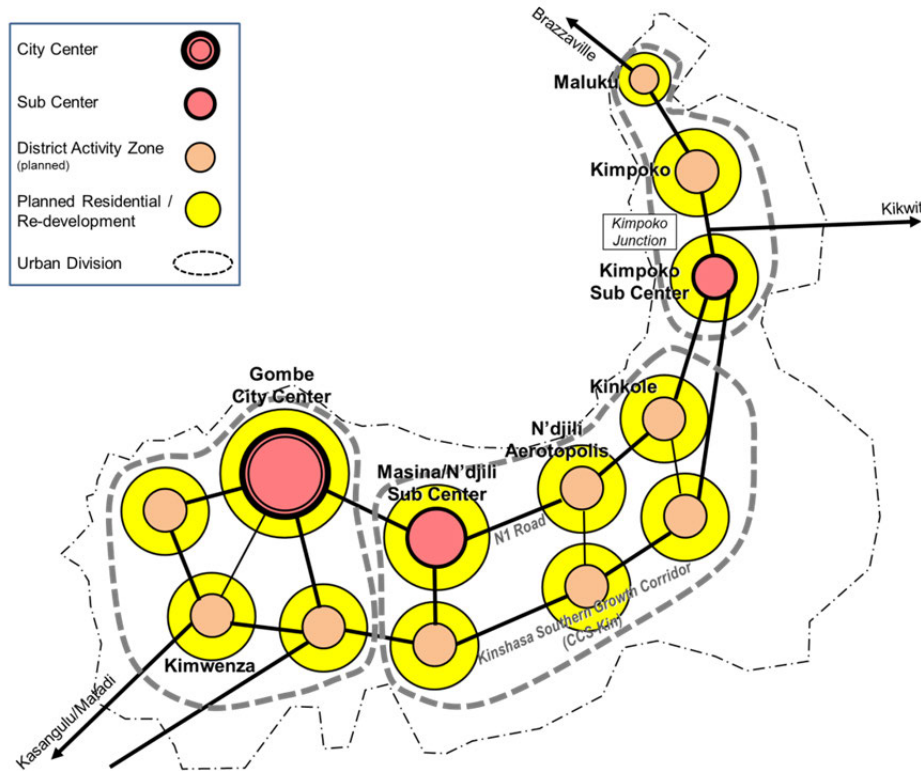
Source: The Study Team

Figure 6.2.3   Scenario 3: Expected Urban Structure with Integrated Developments along the N1 Road and Kinshasa Southern Growth Corridor (CCS-Kin)

- Spatial Solution

[*Development of Southern Growth Corridor*]

This scenario proposes the development of an east-west corridor in the southern area of the Study Area. This road functions as the "Kinshasa Southern Growth Corridor (*Corridor de croissance sud de Kinshasa* / CCS-Kin)", which connects Matadi – Kasangulu – Maluku – Brazaville – Kikwit. Construction of the Maluku-Brazzaville Bridge will change the current cargo movement that is currently through Kinshasa Port. After the opening of the bridge, most of the current cargo from Matadi to Brazzaville will not have to be transhipped at the Port. Such being the case, the most logical solution is to construct a new east-west trunk road in the south of Kinshasa to avoid through traffic (especially industrial cargo) that otherwise traverses into the centre of the city.

[*Distribution of North-South Inner Communal Movement*]

Corresponding to the development of the Kinshasa Southern Growth Corridor (CCS-Kin), north-south links within the southern development corridor will be stemmed out to strengthen the communal trips.

[*Promotion of TOD (Transit Oriented Development*]

The southwest part of the CCS-Kin is planned to follow the alignment of the railway between Kinshasa City and Kasangulu. The areas along the railway section have potential for TOD

development, with improvement of the current railway service between the central stations of Kinshasa City and Kasangulu for passenger commuting.

[*Promotion of Regional Development Solution*]

After the opening of the Maluku-Brazaville Bridge and the CCS-Kin, the current cargo transport using Matadi-Kinshasa Road and Kinshasa-Kikwit Road is expected to disperse into the southern corridor. As this change progresses, the transfer point of cargo is expected to shift. Corresponding to these changes, the gateway function of the cargo transport to Kinshasa City will be integrated into Kasangulu. These regional development strategies should be taken into account when preparing this scenario.

- Structure of urban space

  Aiming at reducing development pressures along the current N1 Road, this scenario intends to distribute urban functions and activities to the southern corridor and circular roads. Strategically planned development zones will attract people to work at district centres near their residence. Moreover, commuting routes will diversify due to the accessible locations of workplaces at each district centre, which is linked with the east-west and the north-south arterial roads. Also, the urban structure will be formed as a network of district centres, instead of a mono-centric urban structure.

6.3   Selection of Preferred Spatial Development Scenario

In this section, the Study evaluates three development scenarios and selects a preferred spatial development scenario. For the selection, the following aspects are set as evaluating criteria. The following six aspects were selected as aspects to be affected by the difference of spatial development scenario, based on the study of similar projects and on the open discussion with the stakeholders.

- Relevance to relating master plans (Appropriateness)

- Impacts on future residential development

- Impacts on future district centre development

- Effects on neighbourhood activities

- Effectiveness of improvement in traffic conditions

- Cost for implementation (Sustainability)

6.3.1   Scenario 1: Spontaneous Urban Development without Active Control and Management (Zero Option)

The evaluation results of Scenario 1 are described as follows, by criteria.

- Relevance to relating master plans (Appropriateness)
  The scenario does not introduce any spatial control and management measures. The master plans, such as SOSAK and National Strategic Transport Plan, are not reflected in this scenario.

- Impacts on future residential development
  In recent years, most of the development activities in Kinshasa are approved without conforming to the relevant plans. Consequently, ad-hoc residential development is pursued

without compatible plans to improve living conditions with proper infrastructure and social facilities.

- Impacts on future district centre development
  Due to a lack of a development plan, it is difficult to undertake implementation of planned development in appropriate locations. As a result, the development projects hardly attract investors with adequate services.

- Effects on neighbourhood activities
  Due to the long distance from the Northern East-West corridor (i.e. N1 Road), new development areas in the foot of hilly areas lack accessibility to goods supply and specific services. As a result, neighbourhood activities are poorly supported by the traditional small shops and street vendors.

- Effectiveness of improvement in traffic conditions
  Expansion of the city towards the east exacerbates traffic congestion on the limited East-West corridor. Individual development activities emerging along the corridor will bring about difficulty in land acquisition for public purpose uses. As the result, the future road network is assumed to be fragmented.

- Cost for implementation (Sustainability)
  Most of the development costs rely on private investment. Public funds are used mainly for the maintenance of the existing urban facilities, but minimal for new development. Poor transport network and urban facilities will cause negative environmental impacts to the urbanized area in the future.

It is difficult to envision a prosperous future vision without a proper development plan and to achieve improvement of the urban environment and balanced development. As a result, the overall evaluation of the scenario 1 is considered "C (Poor)".

Table 6.3.1   Result of Evaluation of Scenario 1

Evaluation Criteria	Evaluation	Description
Relevance to Relating Master Plans	C	The scenario follows eastward orientated development, but not to the southern area of the city.
Residential Development	C	Spontaneous housing development entails social and economic losses of urban amenities.
District Centre Development	C	Disorderly development brings about inefficiencies in developing integrated district centres.
Neighbourhood Activities	C	Insufficient public services in newly developed area will only enable small shops and street vendors to operate.
Improvement in Traffic Conditions	C	Congestion is expected on limited arterial roads. It is difficult to properly develop transport network in the future after city is fully urbanized.
Cost	A	The cost for the transport facilities is minimal among the alternative scenarios, but entails large losses in social and economic conditions.
Overall evaluation	**C⁺**	

Evaluation criteria: A: Significantly positive performance is expected. (Recommended)
   B: Positive performance is expected to some extent. (Fair)
   C: Positive performance can not be expected. (Poor)
   C+: Better than C, but poorer than B or B-.

Source: The Study Team

- Problems and Proposed Countermeasures

  The following problems and countermeasures are suggested for Scenario 1.

  [*Concentration of Urban Functions on Exiting CBD and Industrial Areas*]

  Kinshasa City currently has limited development centres for business, administrative and industrial functions at such locations as Gombe and Limete, and which can accommodate international as well as national functional demands.

  As the city expands, the functional concentration at limited areas forces residents of Kinshasa City to commute long distances to reach the central area for obtaining formal job opportunities.

  Strategic decentralization of these urban functions will enable the city to distribute locations of centre functions and to ease the inefficiency of urban functions caused by the impediments of traffic movements.

  [*Limited arterial roads and mixture of passenger and cargo movements*]

  Current passenger and cargo movements in the east-west direction mostly rely on the N1 Road, which has to accommodate both inter-communal and inter-regional/provincial traffic movements.

  The construction of a new road network is required for the existing as well as future urbanized area, as well as to eliminate the heavily loaded traffic from the intra-urban traffic of the city.

6.3.2 Scenario 2: Distribution of Urban Functions along N1 Road

The evaluation results of Scenario 2 are described as follows, by criteria.

- Relevance to relating master plans (Appropriateness)
  This scenario basically follows the spatial development planned in the SOSAK. However, the Scenario considers the difficulties to construct additional east-west axis roads, other than the existing N1 Road, in the southern area, and therefore gives priority to develop access to the N1 road from the district centres planned in the southern part of the Study Area.

- Impacts on future residential development
  Following the future development areas identified by the SOSAK, residential areas will be developed along the feeder roads stemmed out of the north-south arterial roads, accessible to the exiting east-west axis of N1 Road.

- Impacts on future district centre development
  Major industrial, business and commercial areas will be developed along N1 Road. District centres, small and medium scale industrial and commercial development will cluster along the north-south access roads. Residential areas will be planned around the north-south access roads with the feeder system. This feeder system will encourage the district centre development.

- Effects on neighbourhood activities
  Improvement of north-south roads realize good accessibility from the hill side residential areas to the planned development areas along the N1 road. However, neighbourhood activities are heavily dependent on the north-south access roads and will generate traffic congestion that will hamper accessibility to N1 Road.

- Effectiveness of improvement in traffic conditions
  Improvement of access arterial roads in the north-south direction will provide a linkage from inside the community to N1 Road. Planned roads for Scenario 2 will form a signal to develop more in densely the future transport network in the southern area. Traffic congestion, however, will be increased on N1 Road, especially at intersections between N1 road and north-south access roads.

- Cost for implementation (Sustainability)
  Comparatively fair, in terms of total investment cost, to implement Scenario 2.

It is expected that Scenario 2 will have a positive impact on future urban development. However, urbanization in the southern part of the city is inevitably clustered along the selected north-south arterial access roads to N1 Road, and movements in the east-west direction in the southern area must go via N1 Road. As a result, the overall evaluation of Scenario 2 is considered "B (Fair)".

Table 6.3.2   Evaluation Results of Scenario 2

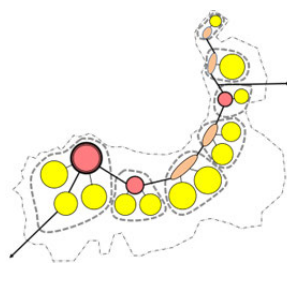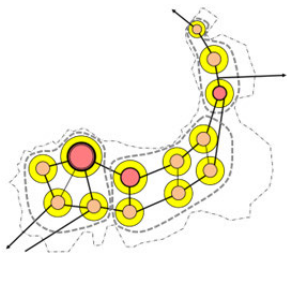| Evaluation Criteria	Evaluation	Description
Relevance to Relating Master Plans	B	The scenario gives priority to achieving balanced development of southern part of the Study Area by providing access to N1 Road from each commune.
Residential Development	B	Compared to Scenario 1, it secures dispersed urban development with improved accessibility to future housing sites
District Centre Development	B	Cluster development will take place along the north-south access roads that connect district centres with N1 Road.
Neighbourhood Activities	B	Feeder system to connect district centres and neighbourhood communities is not planned but developed spontaneously.
Improvement in Traffic Conditions	B	The scenario heavily depends on the existing east-west axis of N1 Road to distribute traffic generated from the southern part of the Study Area
Cost	B	Comparatively fair in the total investment cost
Overall evaluation	**B**	

Evaluation criteria: A: Significantly positive performance is expected. (Recommended)
　　　　　　　　　　B: Positive performance is expected to some extent. (Fair)
　　　　　　　　　　C: Positive performance can not be expected. (Poor)

Source: The Study Team

- Problems and Proposed Countermeasures

The scenario is expected to solve part of the urban problems that Kinshasa City faces currently. However, the following matters are thought to remain even after the completion of this scenario.

a)   Problems and solutions for movement in north-south direction:

Distribution of CBD functions, industrial and commercial functions along N1 Road, as well as north-south access roads, will alleviate the commuting traffic load on N1 Road. However, such inner communal trips generated from the southern urban area will urge more intra-urban linkages to either N1 Road or the north-south access roads. The scenario is not successful in providing effective countermeasures to improve intra-urban traffic in the newly developed southern part of the Study Area.

b)   Problems and solutions for movement in east-west direction

The distribution of clusters such as industrial and commercial areas to N1 Road and several north-south access roads will not alleviate the traffic congestion on N1 Road. It is unavoidable for the present Kinshasa City's spatial structure to rely on the same and sole east–west trunk route, i.e. the N1 road.

Enhancement of the east-west transport capacity is desired as a solution to promote the development of the southern part of the Study Area.

6.3.3 Scenario 3: Development of Kinshasa Southern Growth Corridor (CCS-Kin) and Distribution of Urban Functions along the Corridor

The evaluation results of Scenario 3 are described as follows, by criteria.

- Relevance to relating master plans (Appropriateness)
  The scenario basically follows candidate development areas, proposed spatial structure and transport network of the SOSAK.

- Impacts on future residential development
  Along with improving the living environment, accessibility to the CBD area and workplaces is the important factor that will affect success of residential development in Kinshasa. The transport network and strategic land uses with distributed district centres and housing areas will create a balanced urban development and smooth accessibility for movements in the city.

- Impacts on future district centre development
  Industrial, business and commercial areas are planned in clusters and located along N1 Road, CCS-Kin Corridor and other north-south arterial roads. These areas have convenient accessibility to the centre of Kinshasa, as well as district centres and other regions outside Kinshasa. This is an advantage for attracting investors to settle their business in these areas.

- Effects on neighbourhood activities
  Good transport accessibility to the CBD, sub-centres and district centres helps to offer satisfactory services to everywhere in the city. These areas can correspond to demand of adequate construction sites for new commercial and public facilities.

- Effectiveness of improvement in traffic conditions
  Commencement of planning and preparation for implementation will make land preparation and acquisition of planned project sites easier.

- Cost for implementation (Sustainability)
  It is necessary to secure budget for construction and development in the earlier development stage. Also, the construction cost of infrastructure for decentralized urban spaces requires more cost than intensive spatial development.

Scenario 3 is the ultimate program that contains all mitigations for development demand, except for cost. Considering this matter, the Study evaluates overall aspects of Scenario 3 as "A-(Recommended)".

Table 6.3.3   Result of Evaluation of Scenario 3

Evaluation Criteria	Evaluation	Description
Relevance to Relating Master Plans	A	The scenario basically conforms to the SOSAK, with some modifications caused by the difference in future population projection.
Residential Development	A	Secure balanced urbanization and accessibility to future housing sites.
District Centre Development	A	Integrated industrial and business areas are planned to be spread out throughout the urbanized city area.
Neighbourhood Activities	A	Satisfactory services with good access to district centres to and from neighbourhood communities within adequate distance.
Improvement in Traffic Conditions	A	New constructed roads forms transport network covering all over the city in the future.
Cost	C	Construction/improvement of transport network requires large amount of investment, but contributes to reducing environmental, social and economic losses as a whole.
Overall evaluation	**A-**	

Evaluation criteria: A: Significantly positive performance is expected. (Recommended)
B: Positive performance is expected to some extent. (Fair)
C: Positive performance can not be expected. (Poor)
A-: Better than B or B+, but poorer than A.

Source: The Study Team

6.3.4   Comparison of Evaluation of Three Scenarios

The overall evaluation of the alternative urban development scenarios are summarized as shown in Table 6.3.4. Comparing the results of the evaluation, the Study selects Scenario 3 as the preferred spatial development scenario.

Table 6.3.4   Comparison of Evaluation of Alternative Scenarios

Scenario	Spatial Framework	Over-all Evaluation	Description
1. Spontaneous Urban Development without Active Control and Management (Zero Option)		C⁺	Similar to the existing Lumumba Road, chaotic ribbon development will expand toward Maluk where disorderly situation is emerging in such a mixed situation as motorized and non-motorized traffic, cargo and passenger vehicles in different sizes, access and through traffic, street venders, shoppers and commuters. Informal sector activities along the N1 road will disrupt the development of formal sector and only leave worsened traffic conditions and poor living environment.
2. Distribution of Urban Functions along the N1 Road		B	This scenario assumes to plan the distribution of urban centre activities and work places along N1 road and the housing development to the south of N1 road. However, accesses to N1 road or urban centres/work places are limited and congested by the traffic generated not only from the housing area in the south but also from other cluster development that take place along the access roads. Traffic congestion on N1 road will remain unchanged, as far as all the urban and inter-urban activities depend much on the single east-west axis of N1 road. Further, it will be hard to expect that formal sector development is induced and encouraged along N1 road, since informal sector activities will be attracted inevitably to the area of easy access and concentration of people and traffic.
3. Development of Kinshasa Southern Growth Corridor and Distribution of Urban Functions		A-	New growth corridor offers new development value along the overall road network, and reduces the traffic volume into/ through the current urban area. The planned distribution of urban centres, work places and residential area along the ladder type of road network will enhance the development potentials in the south for the formal sector and endorse better traffic and urban life environment. However, a method of fund raising to invest for the scenario needs to be addressed.

Evaluation criteria   A: significantly positive performance expected (Recommended)

B: Positive performance is expected to some extent. (Fair)

C: Positive performance can not be expected. (Poor)

C+: Better than C, but poorer than B or B-.

A-: Better than B or B+, but poorer than A.

Source: The Study Team

6.4   Spatial Development Strategy

6.4.1   Land Use Policy

Based on the selected preferred scenario (Scenario 3), the Study formulated a land use plan. For land use planning, the Study examined geographical conditions, current land uses and land availability in the Study Area. Given the assumed future social and economic development framework, the land use plan was formulated in consideration of the following major land use planning policies.

(1)   Residential Area

Due to a continuous natural increase and migration of the population in the urban area of Kinshasa, there is limited land space for accommodating new residents. The following shows development policies for the candidate residential areas to be developed and redeveloped.

- Residential area in the periphery
Since the present urban area is highly dense with population, it is necessary to plan residential development in the periphery of the current urban area. From the geographical point of view, most of the candidate areas are located to the east of the current urban area, that is, N'sele commune. Additionally, there are candidate areas to the south of Kimbansake commune, and to the west and south of Mont-ngafula commune. The South Mont-ngafula is attractive if it is developed with a TOD (Transit Oriented Development) policy tied to the improvement of passenger railway services.

- Urban redevelopment for the existing housings area
After development of new housing areas in the periphery, residential areas in the current urban area could then be redeveloped. These redevelopment projects need to consider regulating the overcrowded urban environment, improvement of urban conditions, and introduction of public facilities into the community. These developments will be planned as integrated complex development with high and middle-rise buildings and public spaces.

- Housings in urban agriculture area
Agriculture fields in the surrounding areas of Kinshasa city play an important role by providing fresh foods to the urban residents. Responding to the future increase in demand for fresh agricultural products in the urban area, as well as enhancing agriculture industries, urban agriculture fields mixed with housing development need to be planned.

- Reservation of public facilities in residential area
In order to provide sufficient public services and to implement infrastructure facilities efficiently in the future, it is recommended to notify residential developers in advance of public plans. The local governments and communes should investigate the required land areas for the public services, and urge developers to secure the land as a condition to approve their development.

(2)   CBD (Central Business District), Sub Centre

Gombe and its surrounding communes function as a centre of the country, region and city. The area has close relations with national ministries, agencies and regional government offices. With highly developed infrastructure and urban housings, the area will remain in leading position in business and commercial activities of the area.

As the city grows, the Kinshasa urban area needs to be divided into three Divisions, as discussed in the previous Section 6.1.3, and sub-centres will be developed for each Division to effectively administrate the existing as well as upcoming urbanization.

- Gombe CBD / Governmental zone
  Gombe area will remain functioning as the centre of the national capital, even after the city's area is expanded in future. It generated complementary relations, such as between international and domestic, national and region, politics and commercial, and business and living environment. These relations are based of the roles of the capital city, and the area will be expected to continue to offer these functions.

  Gombe will also undertake the administrative function of the Western Urban Division.

- N'dijili sub-centre
  N'dijili was planned as a new sub-centre of Kinshasa in 1960s. It was located at the east end of Kinshasa urban area, and functioned as the easternmost gateway of Kinshasa at that time. Currently, the area is occupied with a lot of small-/medium-scale shops and offices, but there remain legacies of planned development. N'dijili is expected to be absorbed as the new sub-centre of the Central Urban Division of Kinshasa, in accordance with such a new demand of the area development as the integrated airport development.

- Kimpoko sub-centre
  Kimpoko is located at one of the important nodes of urban structure of Kinshasa, and the area is the gateway of Kinshasa from the central region of the DRC. The area has enough large area for realization of the integrated development with business, commercial, industry and residential functions. Some of the area has obtained development approval, so further development in the future is highly expected in context of current developments progress. Kimpoko, therefore, should be developed as the sub-centre of the Eastern Urban Division.

(3) Business/commercial area

Corresponding to the progress of residential development, it is necessary to prepare district centres for providing public services, commercial services and business working opportunities to new residents.

District centres along new arterial roads
It is recommended to prepare land for district business and commercial centres in relation with construction of new arterial roads. In particular, land development around the major intersections needs to be spatially controlled, in order to avoid overcrowded traffic situation.

- N'dijili Airport industrial zone
  Aerotropolis development could be planned adjoining the N'dijili airport site. Airport related development projects in other countries (e.g. South Africa) prove that there exists demand for adequate industrial sites for international business and industrial services adjacent to the airport.

- Mpasa C&I (Commercial and Industrial) zone
  Mpasa is located near the N'dijili Aerotropolis along the north-south arterial road, which connects the N1 road and the southern East-West corridor. Currently, the road is constructed with sufficient road width, so the area has high potential to attract light industries related to airport services. The area is also expected to realize new north-south development towards the

corridor.

- Kinsuka C&I zone
  The area is located in high land along the Congo River, and offers a quiet and calm business environment. These environments are suitable to establish research high-tech and think-tank businesses, with high-class living and commercial environment for employees of these offices.

- Cogelos Complex zone
  Cogelos is located near the sanctuary of Bonobo, a wildlife preservation area. The area therefore employs zoologists and biologists, and can function as the focal point of related academic research institutions, bio-industries and tourism.

District centres in redevelopment areas

In the existing urbanised area of Kinshasa, the public service level is considered poor due to overcrowding. For these areas, it is important to strategize on how to secure lands for public facilities. The redevelopment projects are one of the solutions to provide public services and to improve living environment at the same time.

- UPN Commercial zone
  The area is the former gateway from the Matadi to Kinshasa. Inheriting these functions, there is a trading market in the area. But major trading functions have moved to the southern area, and the market offers neighbourhood commercial services mainly. Based on these changes, it is recommended to introduce new businesses and commercial functions into the area through urban redevelopment. It is expected that the area generates new value for trading business.

- Cite Verte Commercial zone
  As with the UPN Commercial Zone, the Cite Verte area is a spontaneous logistic area along the Kinshasa-Matadi Road. It functions as a transhipment area of goods and merchandise from the Matadi port, but these functions have moved to the south because of heavily occupied trading shops along the road. Same as the UPN Commercial Zone, this area is recommended to be redeveloped and to utilize efficiently the advantage of the location as the junction of N1 Road and Bypass Road.

(4) Industrial area

Industrial areas are major commuting focal points that provide working opportunities for Kinshasa residents. In order to minimize traffic congestion for commuting and to improve current urban problems, these areas are planned dispersedly in the proposed urban structure. Their locations are planned with consideration of connectivity of major roads and accessibility to neighbourhood residential areas.

- Limete industrial zone
  Limete is the largest industrial area of Kinshasa, and is expected to function in hosting leading industries with a qualified workforce in the central urban area.

- Kinkole industrial zone
  Kinkole is a unique geographically potential area to be developed with river port functions. The area provides wood unloading services and processing industries. The huge hinterland of the port has potential to be developed as an industrial zone with domestic ship transport service.

- Libeya C&I zone
  The area has an ideal geographical feature of balancing agriculture fields with urban development potential. Respecting the advantages, the area is expected to offer agro-industrial and agro-commercial services, such as agricultural experimental station and food product businesses.

- Maluku industrial zone (SEZ: Special Economic Zone)
  A SEZ is planned in Maluku under the assistance of the World Bank, and construction works are progressing in part. The area is considered to play the roles of trading, logistics and processing industries in relation with the construction of the Kinshasa–Brazzaville Bridge.

(5) Industrial zones along new Southern East-West corridor

The CCS-Kin (New Southern East-West Corridor) will function as a major route connecting Matadi, western and eastern parts of Kinshasa, and the central region of the DRC. The sites along the new corridor have a high potential for processing industries of foods and natural raw materials.

- N'sele C&I zone
  The area is located in the intersection between N1 Road and the Southern east-west corridor. The area has high potential as a transhipment station and logistic area. The close distance from the Kinkole port and the industrial zone is also an advantage of the area.

- Kinduti C&I zone
  The area is expected to offer working opportunities to the residents in a newly development area in the east–south areas. The area has advantages for material processing industries, due to realization of smooth access to other regions of the DRC by the corridor.

- N'djili Kilambo C&I zone
  The area occupies an important location connecting the urbanized area of Kinshasa with villages in the south of the Study Area. The area is expected to function as the gateway of the southern areas, and to provide circulation services of the product and goods between these areas.

- Kimwenza C&I zone
  The area is located in the west end of the east-west corridor into Kinshasa City. The area has high potential as transhipment station and logistic area, replacing the function of the current tranship stations along the N1 Road.

(6) Urban agriculture area (Agro-Field)

Considering the importance of the food supply to consumers in the city, urban agriculture areas are planned in the Kimpoko area of Maluku commune, and in the south of Mont-ngafula commune. Food processing industries and bio research facilities are considered in addition to farmland.

- Kimpoko agro-field
  The area has ideal geographical features for urban agricultural activities, and has high development potential for urban development. For these reasons, the area is recommended to be developed as integrated agricultural fields with relating agro-businesses.

- N'sele agro-field
  The area lays in intricate river bank of the N'sele River, and is not suitable for urbanisation.

Thus the area is designated for agricultural land use.

- Kimwenza agro-field
  The area is expected to synchronize agricultural activities in the south of the Study area, and will harmonize the urban and rural activities in future.

As a result, the future land use and development zones are planned as shown in Figure 6.4.1.
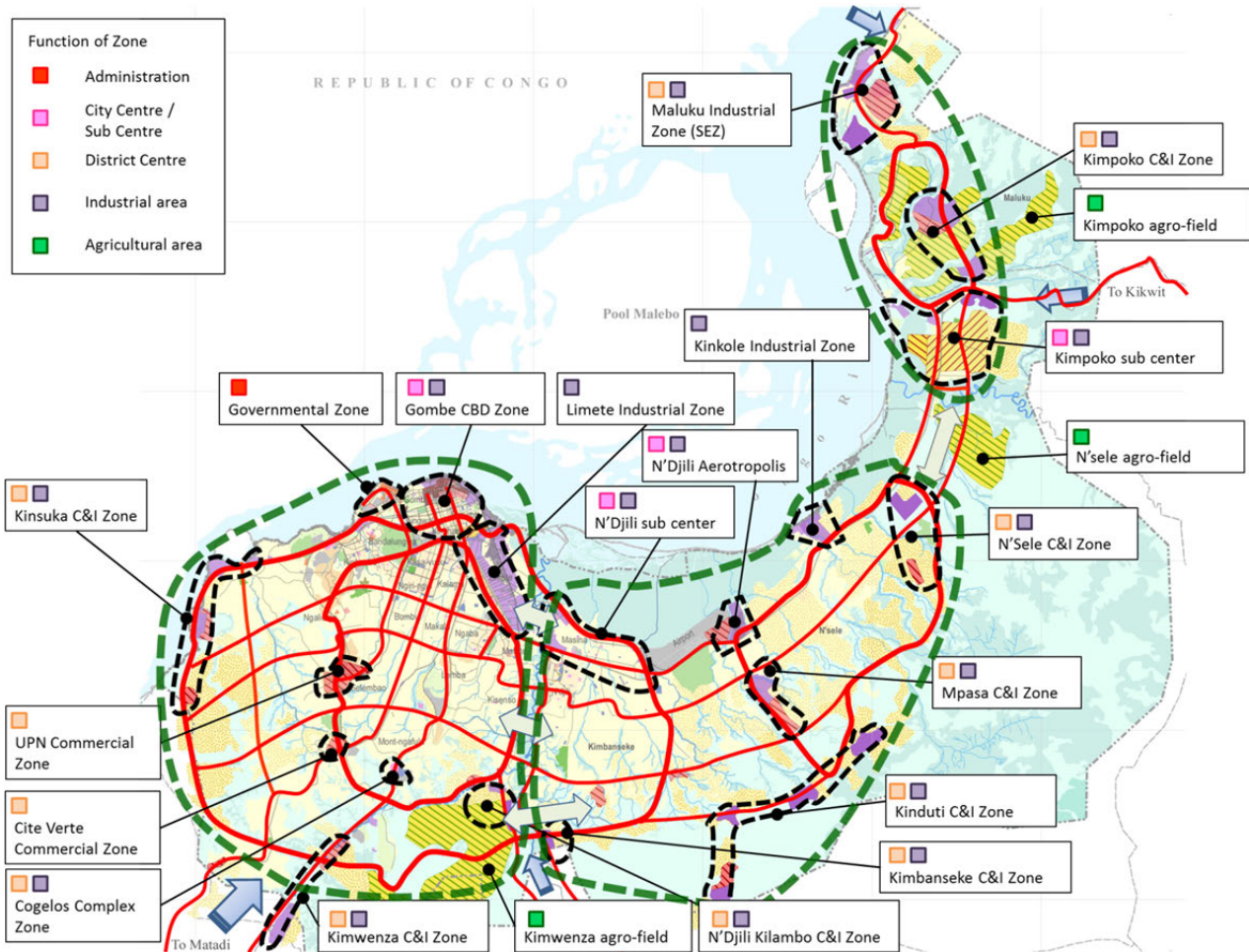
Source: The Study Team

Figure 6.4.1   Spatial Development Strategy (Land Use Policy)

6.4.2   Land Use for 2030 and 2040

Based on the selected preferred scenario (Scenario 3), the Study examined changes in land uses and creation of new development zones in the future. Changes in those developments are planned in terms of the periods 2017-2030 and 2030-2040, and are based on the following conditions:

a. Estimated increase in population for each period;

    b.   Suitable locations and capacity of land for development/uses in residential, industrial, commercial and business;

    c.   Land demand required for residential, industrial, commercial and business developments for each period of time, i.e. 2017-2030 and 2030-2040; and

    d.   Existing as well as future development perspectives of transport network and other urban infrastructure.

(1) Development Progress between 2017 and 2030

The urban development is assumed to progress as if the ongoing development projects for residential, industrial, commercial and business facilities will be completed by 2030. In addition, the densification of land use and modernization of facilities in the existing urban area will be encouraged.

Urban space and function are considered to expand by achieving the plans shown below. The planned land use changes and created new development zones are exhibited in Figure 6.4.2.

a) Construction of new economic centres

Construction of new economic centres are either in progress or have begun at Kimpoko sub-centre, Maluk SEZ, aerotropolis development adjacent to N'dijili Airport, expansion of Kinkole Industrial Zone. Further, there is high potential to pursue new industries, such as Kimpoko C&I Zone for urban type agricultural processing and Kinsuka C&I Zone as a R&D (Research and Development) centre.

b) Progress of TOD development

It should be planned to promote the TOD (Transit Oriented Development) near railway stations and major public transport terminals. In conjunction with the rehabilitation and improvement of the existing railway line of Kinshasa-Matadi, residential as well as industrial development adjacent to the railway stations should be planned at Kilembe C&I Zone and Kimwenza C&I Zone, for instance.

c) Progress of urban redevelopment

It should be planned and implemented to redevelop the existing central urban area by the efficient utilization of land and buildings, in order to create public space to relieve excessively dense land uses and avoid urban disasters. Major intersections on Kinshasa-Matadi Road at UPC Commercial Zone and Cite Verte Commercial Zone could be target areas to be redeveloped for creating a new space for development and securing smooth traffic flows at those areas. In addition, the N'Doro airport area should be redeveloped to create an environment for an integral modern business and residential complex.
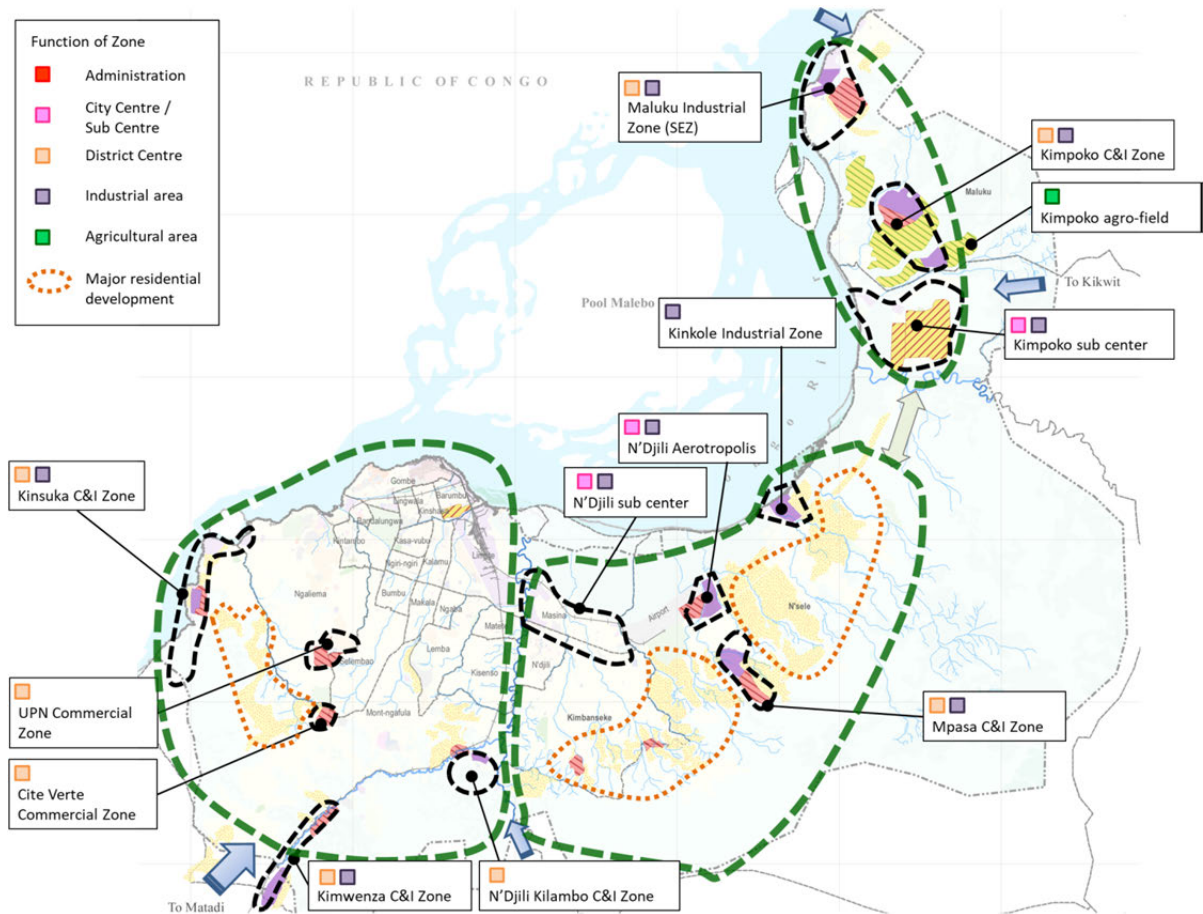
Source: The Study Team

Figure 6.4.2   Land Use Change and Development Zones between 2017 and 2030

d)   Major residential area development

Ongoing housing projects will progress to create new residential areas. The housing development to the south of the hilly areas in N'sele and Kimbansake communes will be pursued together with the construction of the north-south road accessible to N1 Road. Furthermore, the Mikinga C&I Zone on that access road should be planned and developed to provide neighbourhood services and create new job opportunities in the area. Ongoing housing development emerging at the hilly area of the western Kinshasa will be completed and settlement will begin before 2030.

Consequently, the future land use plan for 2030 was prepared as shown in Figure 6.4.3.
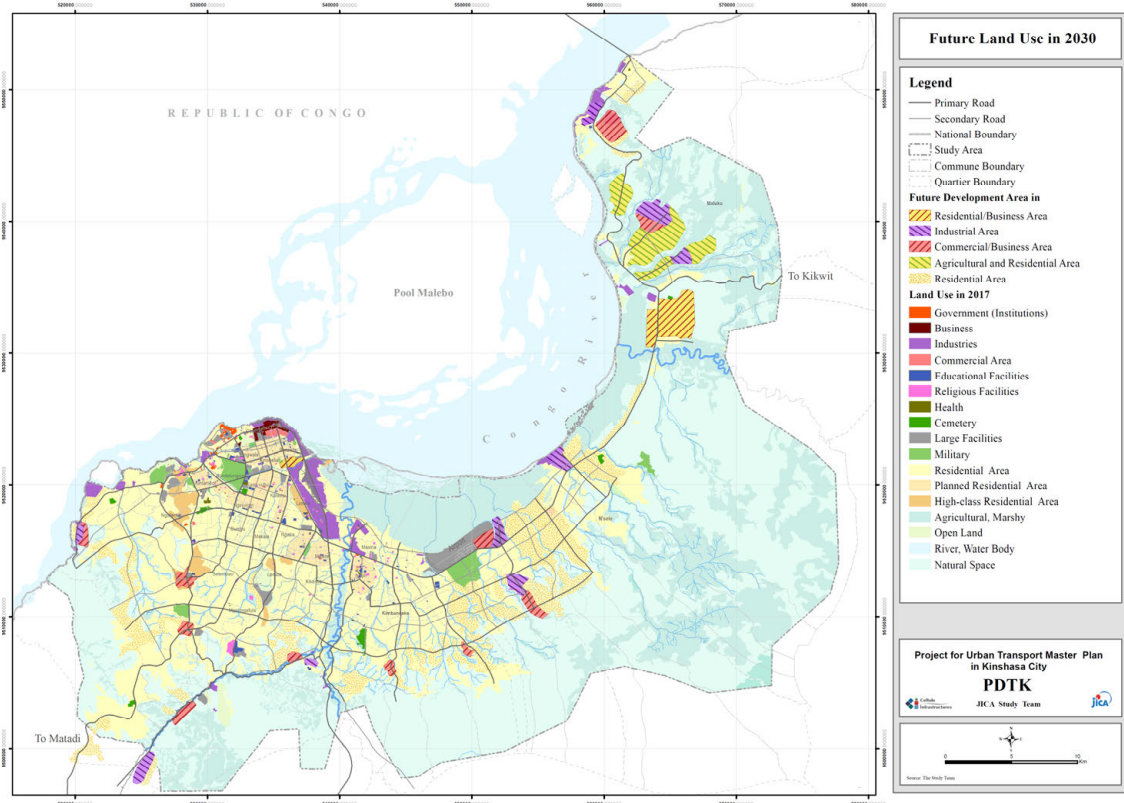
Source: The Study Team

Figure 6.4.3   Future Land Use Plan in 2030

(2)   Development Progress between 2030 and 2040

A new southern east-west corridor should be developed during this period, in order to absorb urbanization pressure and to avoid its concentration in particular area. New development along the southern east-west corridor will be encouraged to promote housing development around the newly emerging development zones, and agro-industries integrated with bio-industry along the corridor during 2030-2040.

The future land use changes and new development zones, which are exhibited in Figure 6.4.4, are planned following the policies below:

a)   Development in connecting zones

Development will be pursued along the South East-West Corridor and the crossing north-south links that forms basic network to connect development zones each other; this will induce in particular industrial, manufacturing and housing development along the network. It is expected that the logistics and raw material processing industries will be encouraged at N'sele C&I Zone, Kiunduti C&I Zone, Kimbansake C&I Zone, N'djili Kilambo C&I Zone, Cogelos Complex Zone; consequently, they will create job opportunities along the southern east-west corridor.
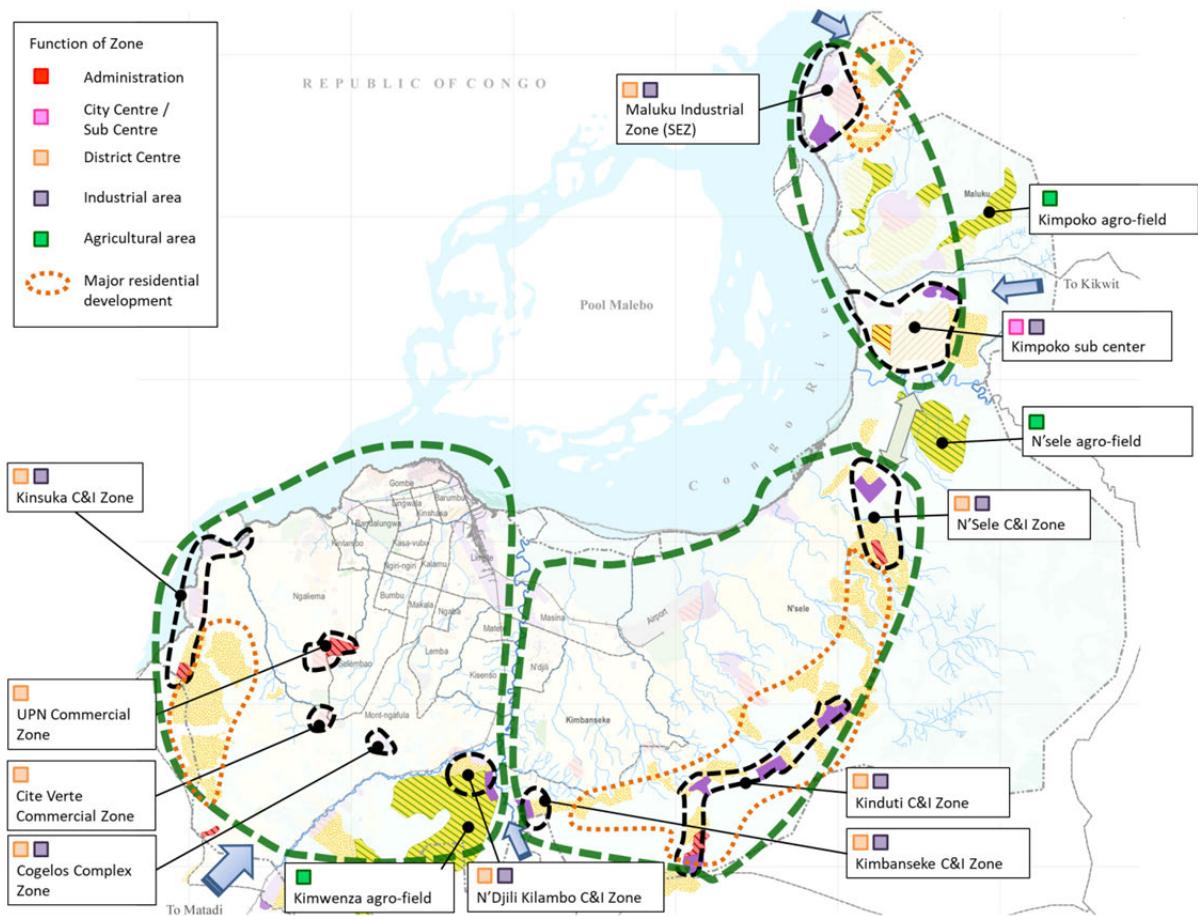
Source: The Study Team

Figure 6.4.4   Land Use Change and Development Zones between 2030 and 2040

b) Progress of urban redevelopment

The urban redevelopment started before 2030 should continue to improve the current built-up area. Encouragement of the urban development outside the current urban area will enable the urban residents to move into the improved environment in the newly developed suburban area, and consequently create urban space in the existing built-up area for more public facilities.

c) Introduction of new industries

It should be planned to foster the agro-industry based on the development policy on the urban type agriculture, bio-industry, R&D and food processing industries. It is a national development strategy to promote the integration of all such industries as the primary, secondary and tertiary industries, flowing sequentially from primary sector. This industrial integration and sequential development flow are considered to fit the characteristics of present Congolese workers and to utilize the existing heritage.

d) Major residential area development

Residential development will become an important issue to provide houses for the people to settle along the Southern East-West Corridor. Dispersed work place development accompanied by the necessary housing will contribute to reducing commuting time, distance and traffic congestion as a whole. Consequently, this will largely help absorb a large population increase in the future for the Kinshasa urban area.

Consequently, the future land use plan in 2040 was prepared as presented in Figure 6.4.5.
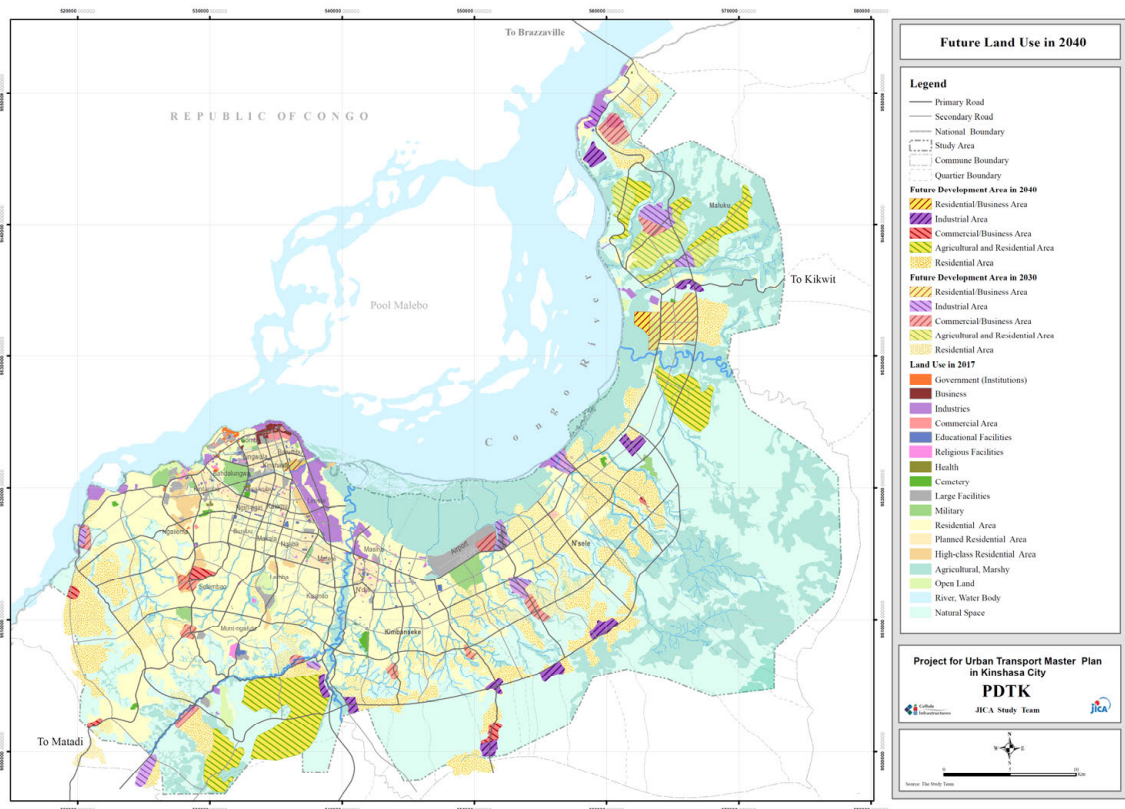
Source: The Study Team

Figure 6.4.5   Future Land Use Plan in 2040

6.4.3   Urban Transport Development Strategy

(1)   Strategic Transport Network

A strategic urban transport network was planned to achieve the following purposes:

    a.   To assure high mobility for large- and heavy-vehicle traffic (large trucks and buses in particular);

    b.   To connect major urban centres, such as city centre, sub-centres, commune (district) centres and development zones;

c. To provide accesses to urban/regional/international gateways, such as seaport, airport, major transport terminals (for long distance freight and passengers services) and industrial zones; and

d. To avoid through traffic that generally hampers intra-urban traffic.

Given the future land use plan and development zones, the strategic transport network is proposed that establishes ring roads that enclose the planned urban divisions; a grid shaped network inside the existing urbanized area of the Western Division; and east-west axes crossing with north-south links in the Central and Eastern Divisions.

A schematic strategic transport network in the Study Area is proposed as presented in Figure 6.4.6. Detailed locations of the strategic network are discussed in Section 8.2 later.
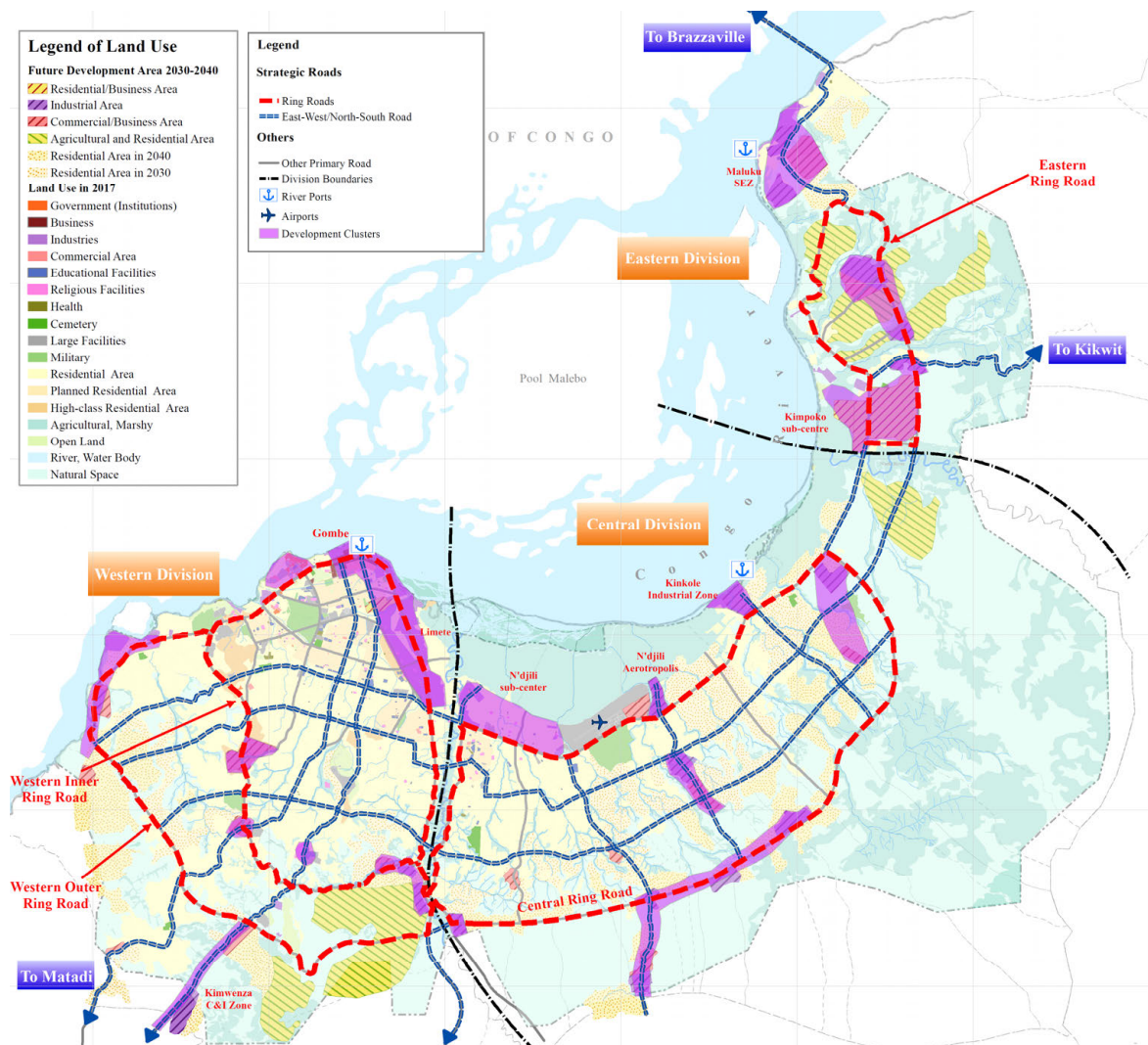
Source: The Study Team

Figure 6.4.6   Strategic Transport Network in the Study Area

(2) Primary Road Network and Urban Structure

a) Primary Road Network

A primary road network that covers the strategic road network is defined to supplement the strategic road network, from the viewpoint of the target spacing of functionally classified road system, to secure equity in accessibility to the trunk road network. The primary road network was formed to reflect the future land use plan, development zone plan and appropriate spacing within the network. The primary road network is proposed to develop in harmony with the land use plans in 2030 and 2040, and phased in construction accordingly.

b) Strategic Urban Development Structure for 2030 and 2040

Based on the proposed future land use plan and strategic/primary road network, future strategic urban development structures for 2030 and 2040 are planned as exhibited in Figure 6.4.7 and Figure 6.4.8, respectively.
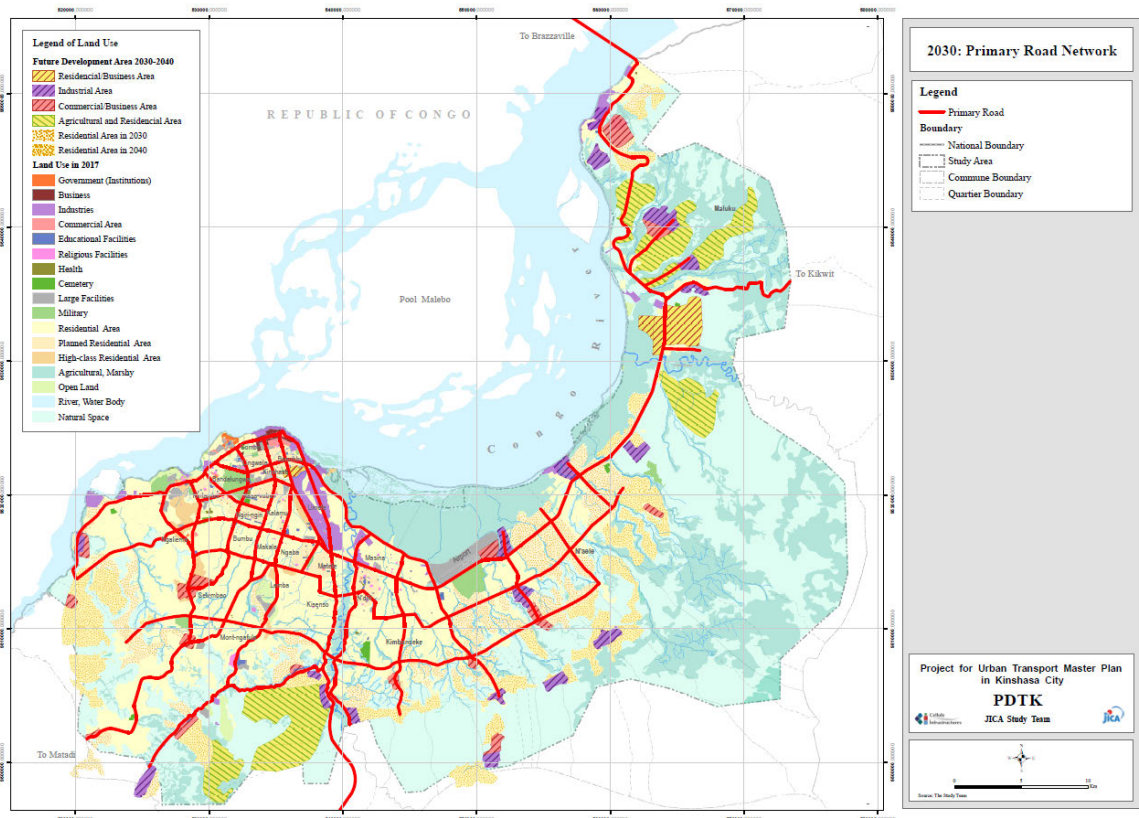
Source: The Study Team

Figure 6.4.7   Strategic Urban Development Structure in 2030
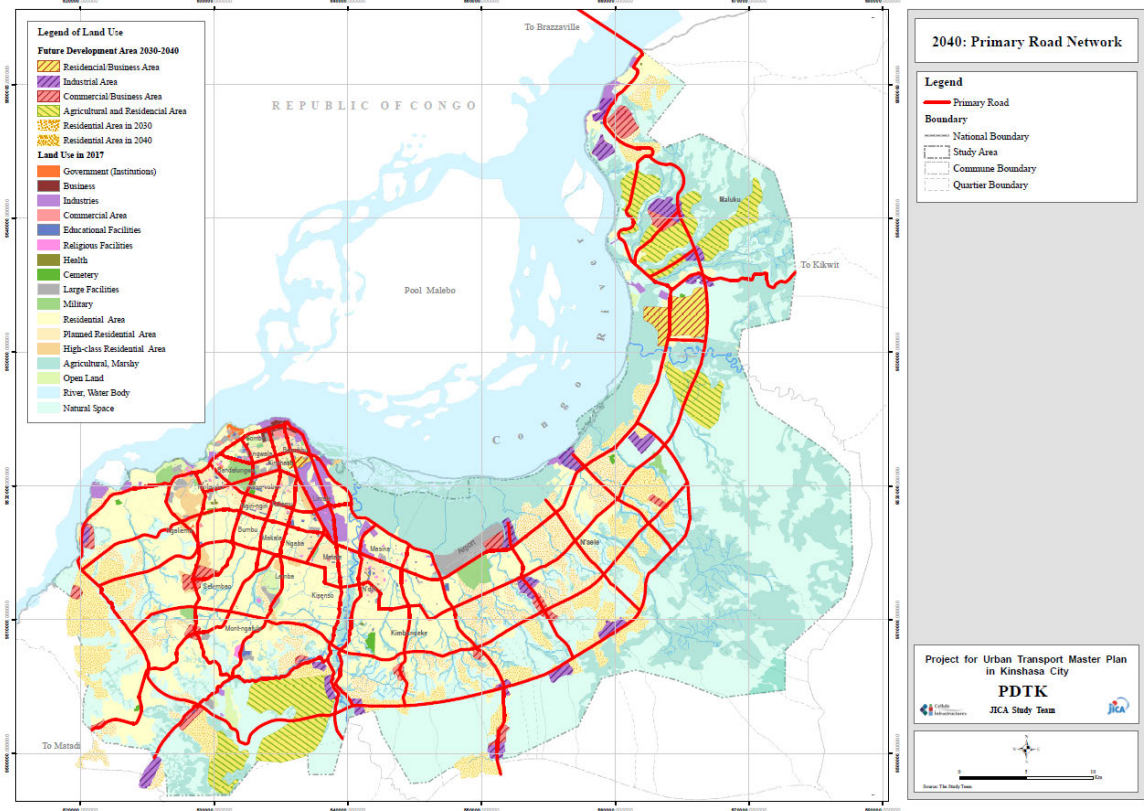
Source: The Study Team

Figure 6.4.8   Strategic Urban Development Structure in 2040

6.5   Legal Framework for Plan Implementation

6.5.1   Issues of Current Legal System and its Improvement

(1)   Plans Formulated according to Definition of the "Decree of the 20 June 1957 on Urban planning"

The decree defines following 4 plans for development.

- General development plan and regulation (*Plan général d'aménagement et des règles générales d'aménagement*)

- Regional development plan (*Plans régionaux d'aménagement*)

- Local development plan (*Plans d'aménagement locaux*)

- Development plan for particular area (*Plans particuliers d'aménagement*)

For Kinshasa City, the following representative urban planning documents have been formulated.

- Regional Development Plan (1967)

- Urban Development Projects (1985)

- Series of large scale urban construction works (2007)

The contents of these plans are not in conformity with the current urban area situation. Moreover, most parts of the Study Area are not covered by these planning documents.

(2) SOSAK

The SOSAK formulates zoning plans with planning index for the 6 communes in the CBD and its surroundings of Kinshasa. The planning index provides BCR (Building Coverage Ratio), maximum building height, and distance from the boundary of development lot.

In order to apply these regulations for Kinshasa City, there still remain the issues below.

- Issues of Planned Area:
  SOSAK prepared detailed plans only for 6 communes. Therefore, it is necessary to additionally prepare detail plans with regulations for the other communes, or establish general regulations to be applied.

- Effectiveness of Regulations:
  Provincial government and communes do not have the suitable organization and human capacity to examine building plans according to the planning index. For executing spatial controls in Kinshasa City, it is necessary to define the authorization process and required documentation for obtaining construction and development approval. The establishment of the responsible organization is also indispensable.

6.5.2 Required Legal System for Realization of Master Plan

(1) Introduction of General Regulating Index

- FAR (Floor Area Ratio)
  Spatial control by FAR is desired in addition to building height control. It is indispensable for balanced area development management with adequate capacity of urban infrastructure, social and public facilities.

- Land use control:
  Control of building use is necessary for realization of favourable living conditions, and for disaster management (e.g. definition of permitted area for industrial factories). The land use control contributes premeditated construction of urban infrastructure. Its stable management attracts private developers to invest in urban development.

(2) Introduction of Control Measure on Urbanization

- Urbanization area, Urbanization control area:
  In order to restrict urbanization in natural hazardous areas, and to avoid spread of diseases caused by insanitary living conditions, it is necessary to define where to urbanize. Urbanization control areas are specified to hazardous areas, agriculture areas and insufficient infrastructure areas, for example.

- Establishment of development guideline:
  Under the limited budget, the government cannot cover all expenses for providing public services. In many cases for provision of development authorization, the government requires developers to be responsible for construction of urban infrastructure (e.g. road, water supply facilities) and/or public facilities (e.g. school, fire facilities). Such planning standards are desired to be formulated as a development guideline. In order to control and manage the planned land uses, both the attraction and constraint measures should be taken. For instance, favourable tax conditions or raised floor area ratios will attract investors, while a strict control of floor area ratios or land uses will discourage investors to violate regulations.

(3) Measures for Security of Lands for Public Use

- Security of land for urban infrastructure:
  It is difficult to acquire land for public infrastructure after urbanization. In many countries, these lands and areas are designated according to the master plan and following detailed plans. Also, development activities in these areas should be controlled and managed.

- Development control for special development area:
  Strategic areas closely related with major infrastructure and primary land should be developed with consideration of maximum use of their potential. For this master plan, the following areas are recommended to be designated as special purpose areas and to formulate their development programs of the whole area with city management view: Maluku SEZ, N'dijili Aerotropolis, Kinkole port area, and Kimpoko sub centre.

(4) Promotion Framework for Construction of Urban Infrastructure

- Construction of arterial roads:
  A framework of Public Private Partnership is frequently applied for construction of urban infrastructure with a limited government budget. Deliverance of development approval along newly constructed arterial roads is often used for motivating private developers' involvement of construction works.

- Development of industrial area:
  In order to promote investment into industrial park development, many governments provide incentives for investors such as subsidies for development. Construction of high quality infrastructure is one of supporting measures for the industrial development.

- Promotion of urban redevelopment, effective utilization of land:
  Efficient land uses in high density areas and improvements to living conditions are critical issues of the urbanized area of Kinshasa City. In order to secure safety and cleanliness, application of an urban redevelopment scheme is worth consideration to realize a higher quality urban life.

- Acceleration of TOD
  Land use potential will be raised if the development is integrated with convenient public transport. In Kinshasa's case, the implementation of TOD is expected to accelerate the economic development and human settlement in the periphery of the city.

CHAPTER 7 Transport Development Scenario

7.1 Urban Transport Issues

### 7.1.1 Rapid and Uncontrolled Urbanization

As discussed in Chapter 5, a significant population increase is expected by the year 2040. The population of the Study Area in 2040 is expected to be more than double to 25.5 million, assuming annual growth rates of 3.5% between 2017 and 2030 and 2.7% between 2030 and 2040. At this moment, only three urban areas in the world, Tokyo-Yokohama (38.1 million), Jakarta Metropolitan Area (32.3 million) and Delhi (27.3 million) exceed a population of 25 million according to Demographia World Urban Areas 2018. The Study Area has to be prepared for this rapid and significant population increase. Needless to say, Kinshasa's transport infrastructure will need to be able to serve 25.5 million people by the year 2040.
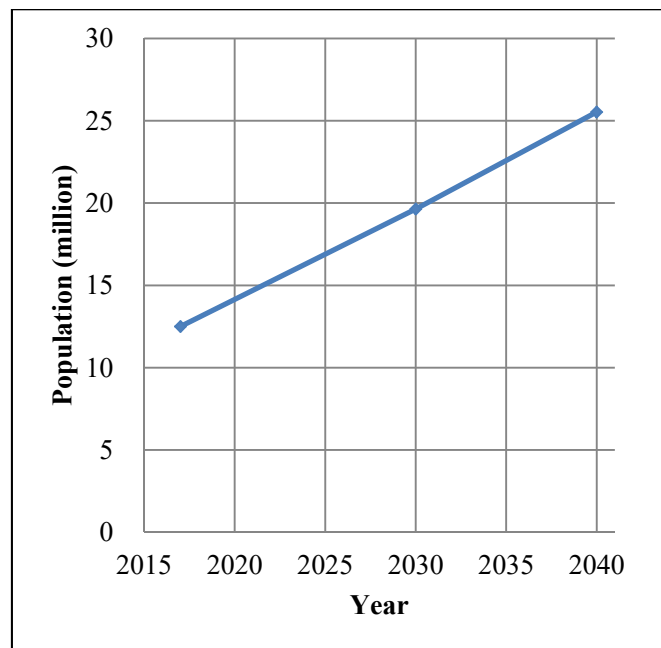
Source: The Study Team

Figure 7.1.1 Estimated Population of the Study Area

Urban sprawl has been observed in the outskirts of the urbanized area a decade ago. A comparison of the latest satellite images with those of a decade ago as shown in Figure 7.1.2, reveals an increase of built-up areas, densification of urbanized areas, and urban re-development. If the DRC Government keeps policies that do not alter the status quo, unorganized, scattered urban sprawl will continue.
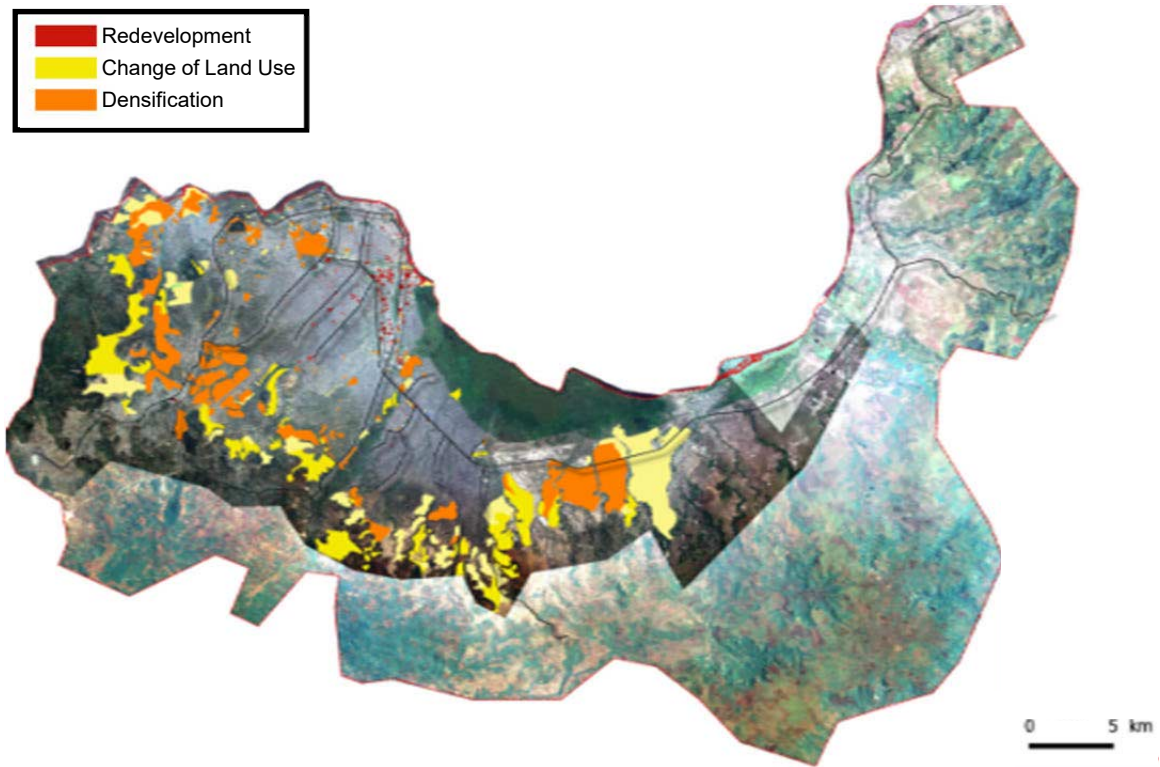
Source: The Study Team

Figure 7.1.2   Change of Land Use between 2004-06 and 2014-17

As discussed in Chapter 6, organized urban development in conjunction with transport network development is essential to control urban sprawl and to form several urban centres along the Southern Growth Corridor necessary to alleviate the concentration of urban activities in the Gombe Commune.

7.1.2   Surging Road Traffic Demand

Just as most urban areas in developed and emerging countries have experienced, rapid motorization in conjunction with economic growth are expected in the Study Area. In the early stages of development, the speed of motorization can exceed the growth rates of the economy and population. This is because people tend to start owning vehicles once their income reaches a certain level. Rapid motorization happens once a large segment of the population reaches this income level.

Assuming an economic growth rate similar to those in emerging Asian countries (as mentioned in Chapter 5), it is estimated that by 2040 there could be 6.3 times as many cars in the Study Area as there were in 2017, as shown in Figure 7.1.3. It should also be noted that the trip rate, the number of trips per day, is expected to grow along with the increases in income and private vehicle ownership.
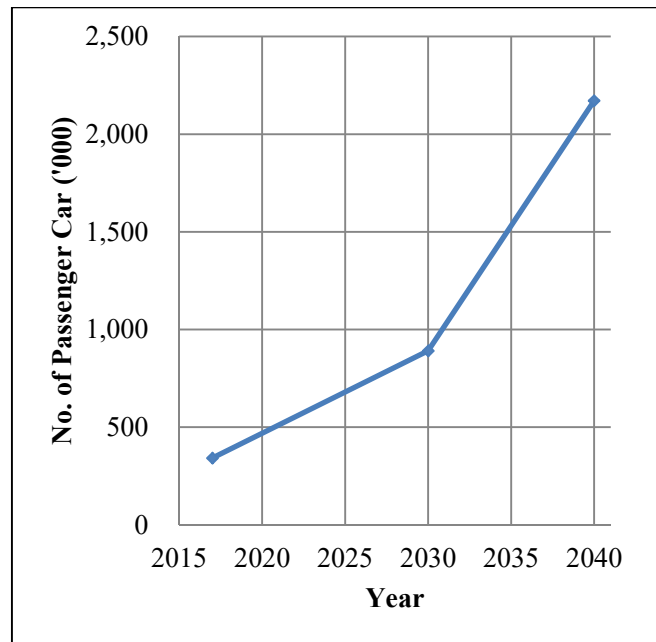
Source: The Study Team

Figure 7.1.3   Estimated Car Ownership in the Study Area

What would happen if minimum countermeasures are taken to manage this extraordinary rapid motorization? The results of the travel demand forecast of the Study Team in the case of Do Minimum scenario are illustrated in Figure 7.1.4, Figure 7.1.5 and Figure 7.1.6 for the year 2017, 2030 and 2040 respectively. While the Do Minimum scenario assumes minimum investment in development of new roads and public transport infrastructure, it includes construction of access roads to new development areas and improvement of the road surfaces of all national, provincial, primary, and secondary roads in the Study Area. Traffic volume capacity ratio (VCR) is shown in colour and the traffic volume of each road is displayed as the width of the road. These figures vividly indicate that the traffic volume of most of the roads in the Study Area far exceeds their capacity in 2040.

This implies that alleviating traffic congestion in the future will not be possible with the existing road network alone. Fundamental countermeasures to manage surging travel demand will be required to alleviate traffic congestion and related economic externalities such as travel time costs, vehicle operation costs, greenhouse gas emissions, air pollution and traffic accidents.
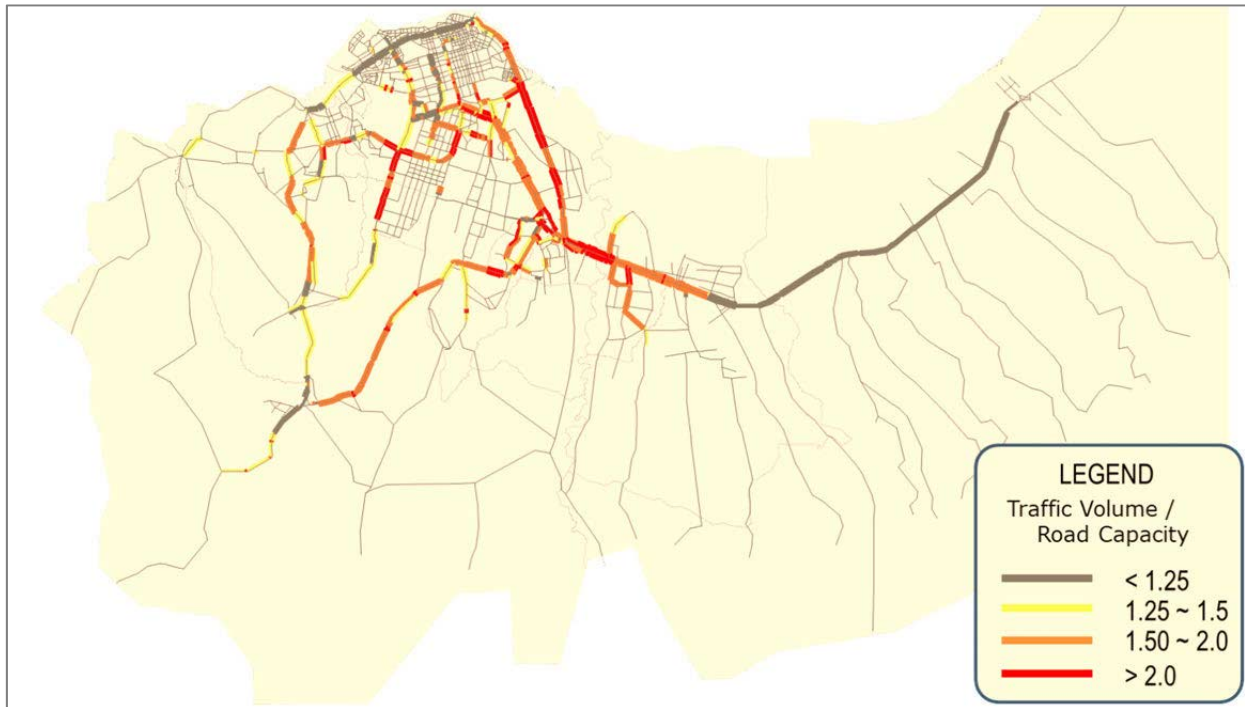
Note: The practical road capacity in 2017, accounting for side friction and road surface conditions.

Source: The Study Team

Figure 7.1.4   Highway Assignment Results in 2017

Source: The Study Team

Figure 7.1.5   Highway Assignment Results of Do Minimum Scenario in 2030

Source: The Study Team

Figure 7.1.6   Highway Assignment Results of Do Minimum Scenario in 2040

Congestion and Motorcycles on Pedestrian Footways in Kampala, Uganda

Congestion of Rickshaws in Dhaka, Bangladesh

Congestion in Colombo, Sri Lanka

Congestion in Jakarta, Indonesia

Source: The Study Team

Figure 7.1.7   Examples of Traffic Congestion of Cities in Developing Countries

7.1.3   Incomplete Road Network

(1) Poor Road Network

The density of the road network is overwhelmingly insufficient against a sudden increase of population. In Kinshasa City the population increased from 900,000 people in 1967 to 10.6 million people in 2013. The fundamental configuration of the road network has hardly changed from 1967.

There are a limited number of trunk roads, and those that do exist are quite narrow, with the exception of a few roads such as Lumumba Boulevard and 30 Juin Boulevard. Furthermore, the trunk roads running in the east-west axis are more insufficient than those running in the north-south axis.

Some sections of the Primary road network are discontinuous such as between 30 Juin Boulevard

and Congo-Japon Boulevard, and between L. Desire Kabila Avenue and Mondjiba Avenue. Some sections of the secondary road network are disconnected and include dead-ends such as Elengesa Avenue, Sefu Avenue, 6 Eme Rue, and La Oux Avenue. The density of the road network is uneven. Moreover, many local roads are interrupted by rivers and streams. Finally, some public facilities such as Kokolo Military Camp, N'dolo Airport and the train depot obstruct direct connections. Therefore, the soundness of the road network is severely compromised.

Objectively, the road network density in the Study Area is quite low at 3.03 km of road per square km. With roads taking up just 2.00% of the Study Area, the road area ratio is also quite low. More than 80% of roads have just one lane and nearly 90% are unpaved. To accommodate the significant increase in population and travel demand, it will be critical to create an efficient and effective road network through the construction of new roads and upgrade of existing roads.

| Gombe Commune | Ngaliema Commune |
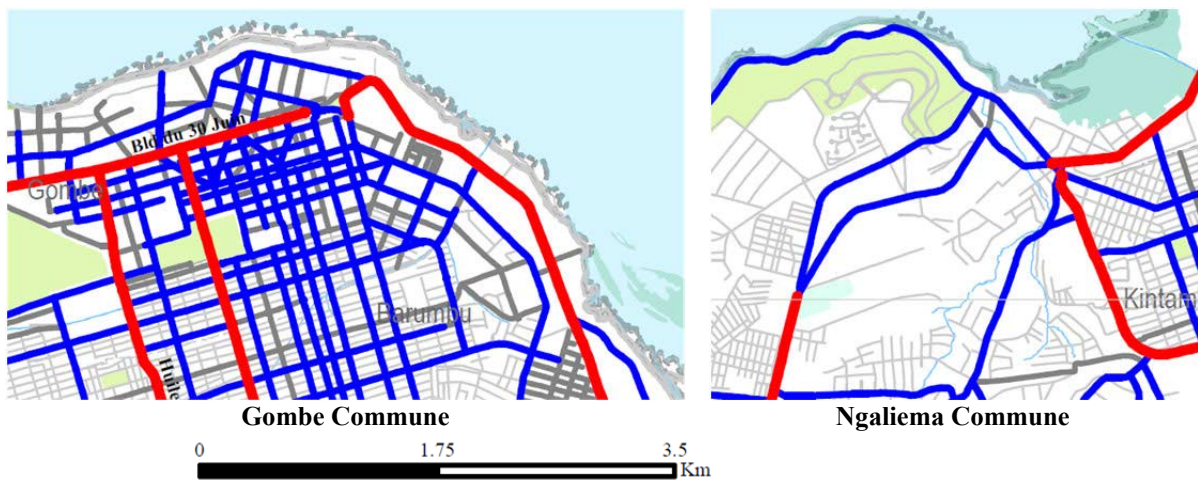
Source: The Study Team

Figure 7.1.8   Road Network Functionality Issues in Study Area

(2) Disrepair of the Existing Roads

Since the socio-economic disorders from the 1990's, the OVD (*Office des Voiries et Drainages* / Office of Roads and Drainage) and the OR (*Office des Route*s / Road Agency) have mainly focused on the rehabilitation and maintenance of existing roads. Many roads, however, have been destroyed by rivers and streams or have many large holes; and ultimately, the roads have fallen into a state of disrepair nearly everywhere. As a result, the roads are difficult to navigate even in the dry season.

On more than half of RIS (Road Inventory Survey) target roads, the surface conditions were found to be poor or worse and to hinder smooth travel. Furthermore, 64.3% of RIS target roads found to be impassable are concentrated in the flat sprawl area. Therefore, restoring and improving these devastated roads is an urgent task.
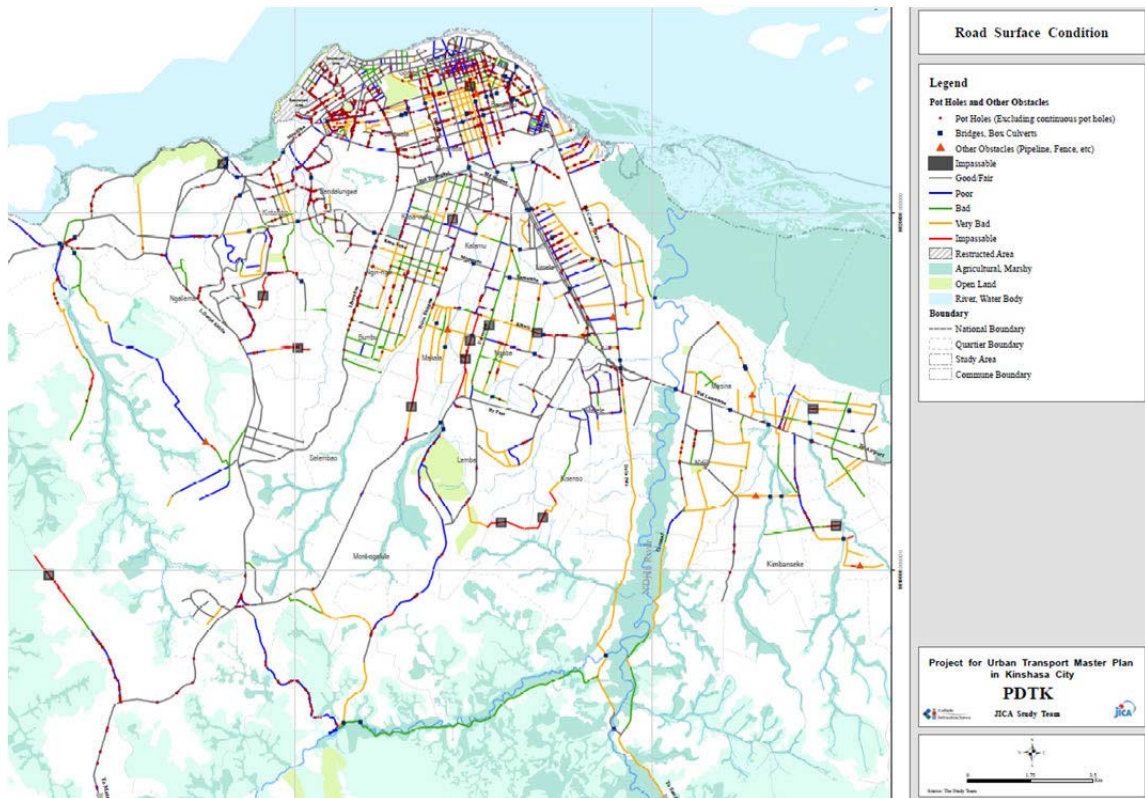
Source: The Study Team

Figure 7.1.9   Current Road Surface Conditions for Target Roads in Study Area

University Avenue in flat sprawling area	By-Pass in hilly sprawling area

Source: The Study Team

Figure 7.1.10   Photos of Road Surface in Suburban Area

(3) Increasing Intensity, Frequency and Duration of Rainwater Inundation

During the last six months alone, Kinshasa City experienced severe rainwater inundation in December 2017 and January 2018, the latter of which included rain-induced landslides that caused more than 44 deaths.

Gombe Commune

Source: The Study Team

Figure 7.1.11   Flooding of December 21, 2017

Those incidents generated by heavy rains occur almost every year during the rainy season and may cause traffic interruption, even in arterial roads.

According to the OVD, there is no system or database to record the location, cost of repairs or duration of effects such as traffic disruption, making evaluation of the impacts caused by disasters and the identification of areas where countermeasures need to be implemented difficult.

More than 37 rivers cross Kinshasa City, and the most destructive flood occurred in December 1961, when the Congo River overflowed. Since countermeasures such as the construction of levees were implemented after the 1967 flood, there are no recent records of the Congo River overflowing. However, damage occurs frequently due to rivers such as the N'djili, Gombe, and Makala overflowing, and the limited capacity of the drainage system to handle the situation.

The changes in land coverage due to the rapid urbanization and forest cutting in the hilly areas or rivers upstream are reducing the capacity of the soil to absorb water in the upstream areas (leading to a higher runoff coefficient); and consequently, the volume of water that flows into drainage channels (rivers, channels, and gutters) is greater than in the past. However, the major channels were planned, designed and constructed during the colonization period.

Compounding this problem is the fact that the discharge capacity of rivers that are the final recipient of urban inundation rainwater before it is discharged into the Congo River is decreasing. The major reasons for this reduction are the accumulation of waste that is hindering water flow and the build-up of sand and mud from the upper stream raising the waterbed level.

Sediment and Waste Accumulation

Waste Accumulation under Bridges

Source: The Study Team

Figure 7.1.12   Reduction of Discharge Capacity

Moreover, the clogging of outlets and decreasing drainage system capacity are lengthening the duration of flooding. In the northern low area of Kinshasa City (the Communes of Gombe, Lingwala, Kinshasa, Barumbu, Limete and Kalamu), the accumulation of waste and mud from upper stream areas in the mild-slope channels prevent the evacuation of rainwater to their outlets and consequently rainwater tends to stagnate.

Furthermore, the duration of water stagnation is also lengthened by the malfunction of the gutter system caused by the deterioration of facilities, which prevents the flow of rainwater downstream. Another reason why this system does not fully function properly is the non-uniformity between existing and newly constructed channels. For example, some channels upstream are connected to existing downstream channels without proper consideration of their actual capacity, and consequently overflows occur and continue until the water levels downstream decrease. Moreover, it was revealed in consultation meetings with the OVD and BEAU (*Bureau d'Etude d'Aménagement Urbain* / Urban Development Institute) that some existing channels have been cut-off by new construction. Consequently, the continuity and full functionality of the drainage system cannot be ensured and the duration of flooding tends to be longer.

7.1.4 Dependence on Market-oriented Public Transport Modes

(1) Less Regulated Road Public Transport Operated by Private Sector

Public transport is the dominant motorized transport mode in the Study Area with a share of over 90%, and it is important for supporting the social and economic activities of citizens in the Study Area. As of 2017, approximately 70% of public transport passengers are using privately operated public transport such as *Esprit de Vie*, *HiAce*, *Combi*, *Esprit de Mort*, taxis (*Ketch*) and motorcycle taxis (*moto-taxi* or *Wewa*). It should be noted that *Esprit de Vie* (which translates as 'the spirit of life') is operated by individual business owners while the DRC Government offers minibuses by credit to them, replacing the *Esprit de Mort* (which means 'the spirit of death') since 2014. Although minibus and taxi-bus vehicles have been renovated under this programme, they are privately operated. As these private operators are less regulated, several issues are observed due to the profit-oriented operations of drivers are motivated by their commission-based salaries.

While there are regulations on fares and routes, as well as vehicle inspections, there are many exceptions. For instance, the drivers of private buses and New TransKin are authorized to adjust their operating schedules and routes according to the traffic demands of the day, at their discretion. With the exception of government-owned Transco (*Transports au Congo*) buses, road public transport does not have designated bus stops and passengers may get on and off at intersections. The regulations are scarcely followed by some operators such as the sub-standard *Esprit de Mort* vehicles.

As a result, bus drivers have little incentive to improve the service quality level for passengers. Most drivers wait until buses are full before departing terminals, and they may stop service in the middle of routes or change the route when demand decreases. They often minimize maintenance to reduce short-term maintenance costs, which often leads to the vehicles breaking down during operations causing significant disruption to their passengers and to other traffic on the road.

Drivers of private transit also compete with each other for passengers. They do not mind stopping their vehicles on the road, often at busy intersections and in front of markets and schools. This significantly reduces road capacity and results in negative economic externalities as shown in Figure 7.1.13.

| UPN Intersection | Lumumba Boulevard |

Source: The Study Team

Figure 7.1.13   Photos of Congestion caused by Taxi-buses and Shared Taxis (*Ketch*)

The Transport Bureau of Kinshasa City regulates public transport fares. Fares were revised in April 2018 and are CDF 500 for Transco (*Transports au Congo*) and New TransKin buses, CDF 600 for taxies and CDF 700 for *Esprit de Vie* as their standard amount. Fares had previously been CDF 500 for all public transport modes. However, it is common for drivers to increase profitability by dividing their routes into smaller sections and charging separate fares for each section.

The Provincial Government of Kinshasa together with the PNC (*Police Nationale Congolaise*, Congolese National Police) is strengthening enforcement on taxis (*Ketch*). The Governor of Kinshasa instructed taxis to be painted yellow, display registration labels and use overhead lamps indicating taxi on May 21, 2018. The PNC started road-side inspections on taxis in June 2018 while a moratorium on penalties was set in place until July 2018 by the Governor. In addition to regulating vehicle colours, routes and fares; the government is expected to introduce policies to minimize the negative impacts of excessive competition among individual operators. These are likely to include requiring bus companies to meet certain qualifications to operate bus routes, strict enforcement on vehicle inspections, route permission control based on passenger demand and the introduction of public transport service standards.

Source: The Study Team

Figure 7.1.14   Yellow-coloured Taxi and Taxibus with Registration Label

(2) Limited Capacity of Road Public Transport Operated by Public Sector

As mentioned in the above section, private bus operators are increasing their revenue by cutting individual routes into several sections. This means a virtual increase of fares for passengers. Additionally, the fares of private operators were increased in April 2018 while the fares of buses operated by the public sector, Transco and New TransKin, were set at CDF 500. This has resulted in the concentration of passengers to buses operated by the public sector in spite of limited capacity. Thus, the passenger occupancy rate of Transco and New TransKin buses are higher compared with other modes. Many passengers are queuing in front of Transco bus stops as shown in the Figure 7.1.15.

Source: The Study Team

Figure 7.1.15   Queue Waiting for the Transco Bus in the Evening Peak

Despite the fixed low fares for public sector buses, assistance to Transco and New TransKin is limited. In the case of Transco, the operating loss in 2017 was approximately CDF 18 billion. Even excluding the depreciation of buses, the operating loss was approximately CDF 4 billion, although they received some subsidies from the Government. According to Transco, the fare necessary to cover expenses for proper bus operations should be CDF 1,600, which is over three times the current amount. As the number of buses is limited to 499 and the number of buses available for operations in 2017 was 392, it is not possible to increase their service without assistance.

(3) Dysfunctional Urban Railway Service

The current urban railway service, with one round trip per weekday operated by SCTP (*Société Commerciale des Transports et des Ports* / Commercial Society of Transport and Ports), is far from the modern urban transport systems of other metropolitan areas around the world. The annual passenger ridership for the last thirteen years of urban railway service is shown in Figure 7.1.17. The average daily (weekday) ridership is approximately 1,600 as of 2017. Ridership declined from 2007 to 2010 due to malfunctioning locomotives and coaches and deteriorating track conditions. Since the two locomotives which were manufactured in Czechoslovakia, funded by the CTB (*Coopération Technique Belge*, *Agence belge de développement* / Belgian Development Agency), started operations in 2011, the number of passengers increased from 2010 to 2012. However, the number of passengers declined again after 2012 due to the bad condition of the two locomotives as those are second-hand. This implies that the potential demand for an urban railway service is high, though railway operations are dependent on the availability of the locomotives.

Source: The Study Team

Figure 7.1.16   Locomotive Operated by SCTP
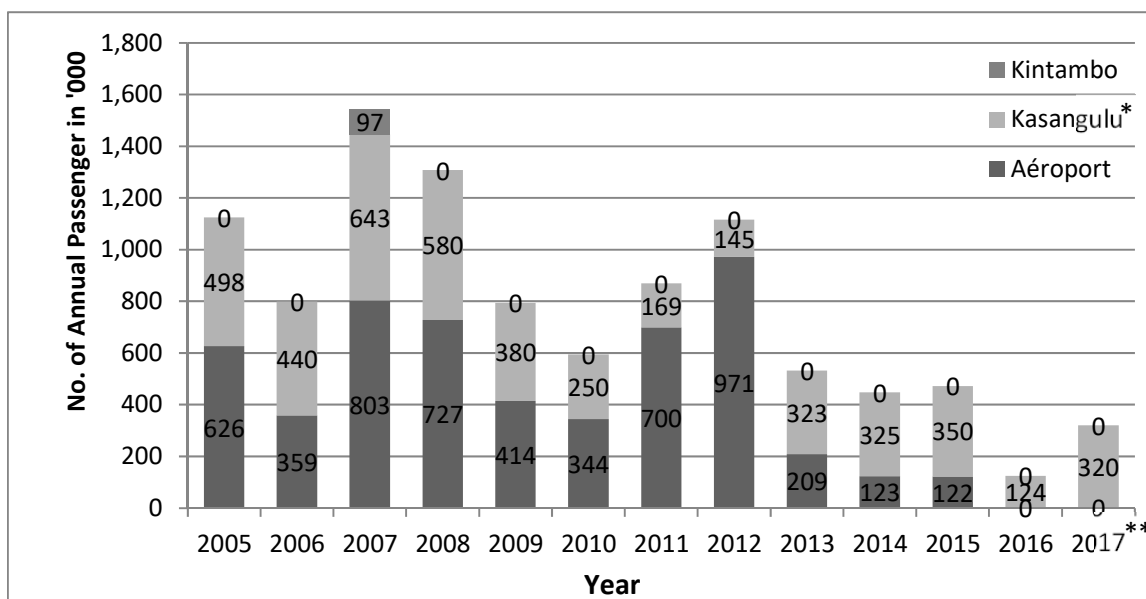
Source of 2005-2006 : Rapport d'activités: Exercice 2014, Department des Chemins de Fer, SCTP

Source of 2007-2016 : Rapport d'activités: Exercice 2016, Department des Chemins de Fer, SCTP

Source of 2017 : Department des Chemins de Fer, SCTP,

*Kasangulu includes passenger to/from Kimwenza.

**2017 annual passenger is estimated by the passenger from January to June, 2017.

Figure 7.1.17   Annual Urban Railway Ridership by Line

It is noteworthy that the railway systems in operation were developed over a century ago, and that some pre-existing lines are no longer in service. Considering the fact that the urbanized area of Kinshasa City has little open space for development and that railways have greater capacity to carry passengers and goods than other modes of transport, the railway rights-of-way (including abandoned lines) are critically important assets for future transport system development.

Problems are observed in almost all aspects of urban railway service, including operations, finance, infrastructure, rolling stock and institutional organization. In order for railway service to function as a significant part of the urban transport system, significant policy intervention is required.

(4) Urban Areas Inaccessible by Public Transport

Residents of areas with low traffic demand and undeveloped roads are often compelled to use taxi-buses, taxis and moto-taxis (motorcycle taxi) because there is usually no or limited public bus and private bus service. While the fares are similar, these modes end up being relatively expensive due to the fact that the routes are shorter. Therefore, people without access to affordable public transport service usually have to reply on non-motorized transport. This is particularly true for people with household incomes less than USD 200 per month, for whom 58% of trips are by non-motorized transport such as walking and bicycle.

7.1.5   Traffic Flow without Control

(1) Traffic Flow in Kinshasa City

The travel speeds of motorized vehicles in Kinshasa City, shown in Figure 7.1.18, are slow during peak hours due to the vehicles being concentrated on the limited road network. This is particularly true near major intersections which have large markets and public transport transfer points (poles) nearby, along roads in poor condition (unpaved and full of potholes), and on roads with many vehicles parked or stopped on the street and with street vendors.
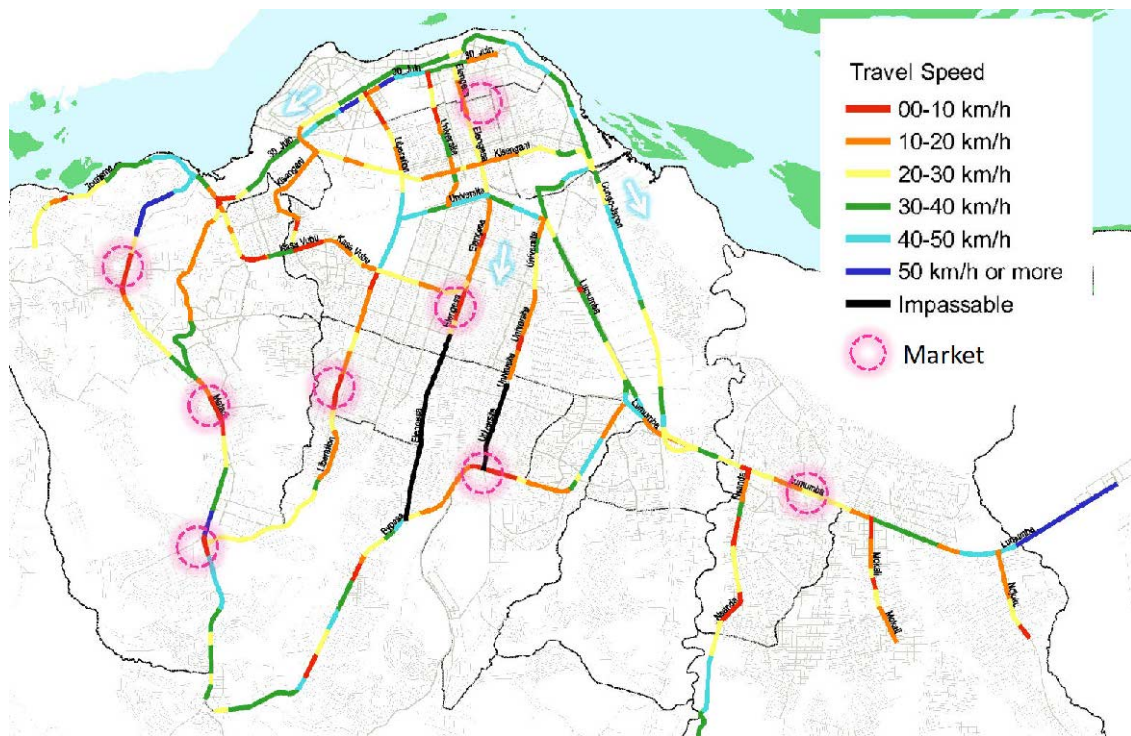
Source: Travel Speed Survey, The Study Team

Figure 7.1.18   Average Travel Speeds during Evening Peak hour (Outbound, 6-7 pm)

Broken traffic signal   Traffic control by police   At the intersection

Source: The Study Team

Figure 7.1.19   Main Factors of Traffic Congestion

According to the CNPR (*Commission Nationale de Prévention Routière* /National Road Safety Commission), 75 traffic signals have been installed in Kinshasa City. Traffic signals are normally

installed on a road project basis, which means the authorities responsible for installation differ from intersection to intersection, and the management of traffic signals is the responsibility of the CNPR. Once traffic signals are broken, they tend to remain inactive due to the lack of financial resources and ability to fix them.

| With countdown display | Robot traffic signal | Inactive |

Source: The Study Team

Figure 7.1.20　Traffic Signals in Kinshasa City

(2) Issues in Relieving Traffic Congestion

The issues in relieving traffic congestion are described as follows:

a) Missing links in the road network and poor road conditions

One of the main reasons for traffic congestion in Kinshasa City is that traffic is concentrated on a limited number of connected roads into the city centre, due to the lack of roads and poor road conditions that produce many missing links in the road network. It is necessary to connect the missing links in order to disperse the traffic flow and sustain urban activities.

b) Bottleneck points due to the absence of traffic signals

Queues of traffic congestion often start from an intersection where several roads gather and become bottleneck points. It is critically important to properly control the traffic flow at intersections. Many traffic signals are not in operation at intersections in Kinshasa City and improper traffic control by the traffic police officers worsens the traffic flow. Therefore, it is necessary to repair and properly maintain traffic signals. It is recommended to upgrade the traffic signal control system in order to be able to coordinate the signal phasing with the traffic demand. Additionally, the geometric design of many intersections should be improved to facilitate smooth traffic flow and support traffic safety.

c) Inadequate parking management

Vehicles parking or stopping on the sides of streets reduce the capacity of traffic flow and cause traffic congestion. Therefore, proper parking management is necessary to increase traffic capacity and ensure smooth traffic flow.

d) Lack of planning and coordination between land use and transportations

The construction of new roads and improving bottleneck points are supply-side measures. Demand-side measures also need to be considered at the same time, such as encouraging route

changes by providing traffic information and modal change by providing attractive public transport systems as part of TDM (Transport Demand Management) approaches. Additionally, markets and transit terminals (poles) are the locations where people spontaneously concentrate currently; but these locations need to be reconsidered in order to ease traffic congestion.

e) Lack of proper enforcement and traffic control

Currently, traffic control at major intersections with no traffic signals is the responsibility of traffic police officers. However, sometimes traffic is not properly controlled because the abilities of the traffic police officers differ from person to person, and often the officers assigned to intersections are unfamiliar with the local traffic conditions. Adequate training for traffic police officers and proper enforcement are necessary.

7.1.6 Traffic Accidents

(1) Traffic Accidents in Kinshasa City

Road accident data is summarized by the CNPR. In Kinshasa Province, the number of fatalities increased by 1.8 times in the 15 years between 2001 and 2016. According to a survey conducted by Handicap International (an NGO), which has been one of the partners on road safety in the DRC, 53% of residents in Kinshasa City have experienced road accidents.

There is no statistical data on locations with high risk for accidents, but according to the CNPR the following roads have many accidents: Lumumba Boulevard, By-pass, Nguma Avenue, University Avenue, and 30 Juin Boulevard.

Many problems were observed regarding traffic safety in Kinshasa City such as speeding, dangerous overtaking, drunk driving, busy intersections without traffic signals, lack of traffic signs, illegally parked vehicles, and overloading of goods and passengers. Drivers are accustomed to not using seat-belts or not wearing motorcycle helmets. Drunk driving enforcement is not done on a regular basis, partially due to the fact that traffic police do not have sufficient alcohol testing kits.
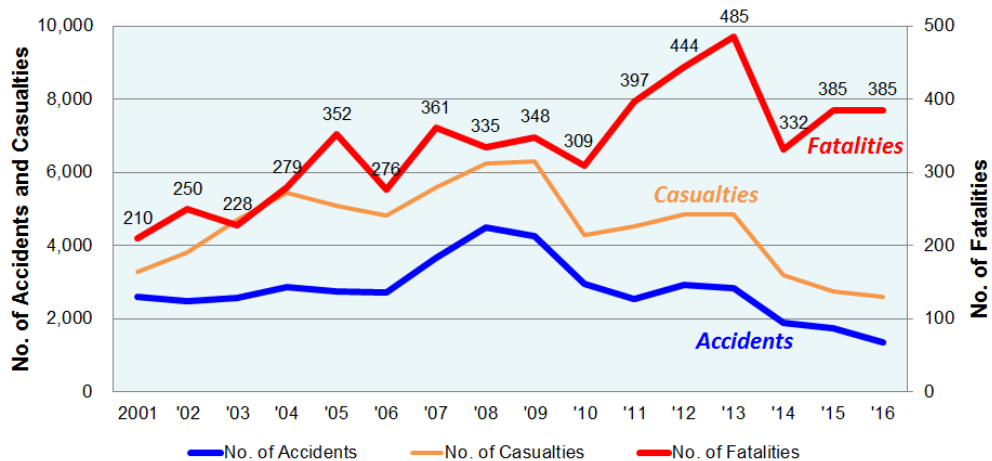
Source: CNPR

Figure 7.1.21   Number of Fatalities, Casualties, and Accidents in Kinshasa Province

Table 7.1.1   Main Causes of Traffic Accidents in Kinshasa Province in 2016

		Number of Accidents
Speeding	*(Excès de vitesse)*	739
Disregarding traffic priority	*(Refus de priorite)*	136
Dangerous passing	*(Mauvais dépassement)*	107
Mechanical breakdown	*Pannes techniques*	103
Tailgating	*(Non-respect de la distance entre les vehiclues)*	44
Other causes	*(Autres causes)*	218
Total	*(Total)*	1,347

Source: CNPR (CNPR, PCR and Hospitals)

Source: The Study Team

Figure 7.1.22   Goods Overloading (left) and Pedestrians Crossing Arterial Road (right)

(2) Traffic Safety Issues

Traffic safety issues in Kinshasa City are described as follows:

a) Lack of scientific (evidenced-based) approach

Accident data needs to be systematically collected through collaboration between the PCR, hospitals and the CNPR. Historical accident data analysis needs to be performed, not only for road accident data, but also for monitoring indicators such as motorcycle helmet and seat-belt usage rates. An evidence-based approach enables us to identify high-risk locations and target policies we should focus on to improve traffic safety.

b) Lack of the system to secure safer road infrastructure

In securing and maintaining road infrastructure, it is important to examine road safety during each step of the design, construction, and operational and maintenance stages. It is recommended for all new road projects to conduct a road safety audit as part of the project to assess roads from the viewpoint of safety.

There are 12,000 traffic signs in Kinshasa City according to the CNPR. However, this amount is insufficient to adequately control traffic, and more signs need to be installed for proper law enforcement.

c) Traffic regulations and poor law enforcement

Lack of discipline by drivers is a concern for traffic safety. Monitoring traffic infractions, issuing warnings, and strengthening enforcement are necessary to address this concern. On the other hand, inappropriate enforcement of traffic rules can also be seen in Kinshasa City. Harassment by traffic police is one of the causes of people not respecting the traffic rules and this situation needs to be improved.

d) Continuing education and awareness for traffic safety

The CNPR and supporting coalition parties have developed education programmes and campaigns to enhance traffic safety. Speeding, drunk driving, and lack of wearing motorcycle helmet and fastening of seat-belt are considered to be the key behavioural factors that put drivers at risk. Education for children and traffic safety awareness activities need to continue as regular programmes for all road users.

e) Post-crash response

The current means of transporting accident victims to hospitals is not sufficient and includes transport provided by the Red Cross, the fire department, and some voluntary road users. On-site care and medical treatment for victims needs to be improved in terms of human resources and medical equipment.

f) Pedestrians and vulnerable road users

Walking is the primary travel mode in Kinshasa City. Vulnerable road users, including pedestrians, are easily seriously injured or killed if caught up in an accident. Adequate road and pedestrian facilities, street furniture and signs for pedestrians and bicyclists need to be developed so that vulnerable road users are able to move safely.

7.1.7 Institutional Issues

Urban transport sector institutional issues are summarized in this section by each sub-sector.

(1) Road Development, Maintenance and Management

a) Organizations and Institutions for Road Development, Maintenance and Management

There are multiple government agencies involved in road development, maintenance and management in Kinshasa City. The main organizations are:

- CI (*Cellule Infrastructures* / Infrastructure Unit)
- OR (*Office des Route*s / Road Agency)
- OVD (*Office des Voiries et Drainages* / Office of Roads and Drainage)
- ACGT (*Agence Congolaise des Grands Travaux* / Congolese Agency of Great Works)
- FONER (*Fonds National d'Entretien Routier* / National Road Maintenance Fund)

Table 7.1.2 is a matrix showing the responsibilities of the agencies concerned.

Table 7.1.2   Responsibilities Regarding Road Development, Maintenance and Management

Institution or Agency		Responsibilities	Engineering	Implementation	Operation& Maintenance	Education	Research
Ministry of Infrastructure, Public Works and Reconstruction (MITPR, *Ministère de l'Infrastructure, des Travaux publics et de la Reconstruction*)	CI, Cellule Infrastructure	・Fund raising ・Setting up techniques and finance for projects ・Financial management ・Interface between MITPR and permanent structure/agency under MITPR	XX				
	OR, Office des Routes	・Planning (design and studies), routine maintenance, rehabilitation and modernization of roads at the national and provincial levels (national and provincial roads) ・Construction of road drainage and sanitation facilities	XX		XX	XX	X
	OVD, Office des Voiries & Drainage	・Planning (design and studies), routine maintenance, rehabilitation and modernization of urban roads	XX		XX		
	BTC Bureau Technique de Controle	・Controlling techniques and finances at the execution stage on behalf of the government and the public companies ・Making revisions on the price variation form in the committee ・Updating the general regulations on public procurement.	XX		X		
	DPC Direction des Points et Chaussées	・Supervising work execution, monitoring and evaluation	XX				
	ACGT, Agence Congolaise des Grands Travaux	・Design infrastructure projects (PPP/PSC), ・Management of infrastructure projects, supervising project works, ・Covering eight basic infrastructure sectors.	XX				
	BEAU, Bureau d'Etude d'Aménagement Urbain	・Designing and implementing Urban Development Plans (PDU) ・Designing and managing urban development projects ・Monitoring and controlling	X				

Organization		Role					
Ministry of Environment (*Ministère d'Environnement*)	ACE	・Evaluating and approving environmental impact studies ・Monitoring the implementation of ESMP(Environmental and Social Management Plan)	X				
Ministry of Planning (*Ministère du Plan*)	INS	・Evaluating conditions of the beneficiaries of projects	XX				
FONER (*Fond National d'Entretien Routier*)		・Collecting funds for maintenance ・Distributing funds for maintenance to authorities	X	Budget implementation	X		
Government of Kinshasa City	Ministère Provincial du Plan, Travaux Publics et Infrastructures	・Developing provincial infrastructural policy ・Supervising implementation of provincial structural public works projects	X	supervising			
	RATPK Régie d'Assainissement et des Travaux Publics de Kinshasa	・Managing and coordinating all activities related to wastewater, waste and sanitation) ・Controlling and supervising works	XX		XX		

Remarks: XX : Primary responsibility, X : Secondary responsibility

Source: The Study Team

b) Organizations and Institutions Related to Drainage

The drainage system in Kinshasa City is managed by road organizations such as OR and OVD, river organisations such as RVF (*Régie des Voies Fluviales /* Inland Waterway Authority) and authorities such as RATPK (*Régie D'Assainissement et des Travaux Publics /* Drainage and Public Works). The roles and areas of intervention for each organization can be considered as the following, based on the results of consultation meetings and questionnaires:

Table 7.1.3   Organizations Related to the Drainage System of Kinshasa City

Organization	Roles and area of intervention related to drainage
RVF	✓ RVF is a state-owned company in charge of managing rivers used for fluvial transportation (e.g. large rivers such as the Congo River) ✓ RVF is responsible for dredging and maintaining these waterways, but due to the lack of dredging equipment, maintenance work cannot be fully conducted.
OR	✓ Annual Budget allotted to the construction and management of the gutters does not exist. However, a small budget is secured through the Programme of Maintenance. ✓ In cases of disaster, early damage cost estimates are made. ✓ In 2013, a total of USD 419,043 was allotted to the improvement of the storm water collection basin Munkole, near the By-pass.
OVD	✓ Dredging rivers not used for fluvial transportation (such as the Gombe River and small to medium rivers) and gutters alongside roads. ✓ The dredging of rivers is planned every five years and the gutters are dredged twice a year. ✓ Gutter dredging is conducted before and after the rainy season (August to October and February to May). ✓ The average volume of dredged mud is 120,000 m^3/year.
RATPK	✓ Works closely with the OVD and is responsible for managing and coordinating all activities related to sanitation, the environment and infrastructure in Kinshasa City.

Source: The Study Team

c)   Road Development, Maintenance and Management Issues

Human Resources

The workforce has been facing accelerated ageing for many years, making it difficult to smoothly transfer skills and knowledge among each organization; and for the OR in particular, which doesn't have enough young engineers in spite of the large overall number of engineers. As for capacity building, OR has its own training facility with two training rooms (a large room with a capacity of 42 seats and a small one with a capacity of 12 seats) which were renovated and equipped in 2015. There were 275 people in total who underwent five training sessions conducted in the OR training facility as shown below.

Table 7.1.4   Training Conducted by OR in 2015

No.	Domain	Number of Sessions	Number of Participants*	Funded by**
01	Civil Engineering	7	121	OR, FONER, WB/pro- routes
02	Mechanical Engineering	3	85	U.E/PARAU
03	Naval Mechanics	1	5	Belgian Cooperation/ CTB
04	Management	1	5	OR
05	Data Processing	3	59	OR
	Total	15	275	

* Training not limited to OR personnel; others, including OVD personnel, also attended.

** Training activities in 2015 were borne by OR, FONER, EU/PARAU, JICA, WB and Belgian/BTC Cooperation. EU/PARAU was the donor who invested the most in the capacity building component of OR in 2015

Source: OR 2015 Annual Report

The sufficiency of training sessions will be examined in comparison with the skills and knowledge to be updated, the number of people whose capabilities need to be built up and other related factors.

Equipment

Major equipment issues include a failure to repair equipment and insufficient capabilities of operators and mechanical engineers. Up to the beginning of the 1990s, road operation and maintenance forces used to be deployed throughout the four districts of Kinshasa City. Although road operation and maintenance equipment was provided to the OVD as part of grant aid in the late 1980s, there is currently not sufficient road operation and maintenance equipment remaining for even one district, and most of what does remain is not in working order. They still have difficulties procuring spare parts, though they have procured some equipment made in China with their own resources. Therefore, some essential equipment has been rented from private companies.

Financing

There are three kinds of financial resources for road operations and maintenance: FONER, the central government, and the provincial government. It is planned that 60% and 40% from 95% of FONER's revenue is to be allocated to the budgets of OR, OVD and other organizations, in order to implement their road operation and maintenance plans. However, the full amount of the budget is not always implemented by FONER, which makes it difficult for OR and OVD to execute their road operation and maintenance plans.

(2) Traffic Safety, Control and Management

a) Organizations and Institutions

There are multiple government agencies involved in traffic safety and traffic management in Kinshasa City. The main organizations are:

- CNPR (*Commission Nationale de Prévention Routière* / National Road Safety Commission)

- Provincial Ministry of Transport, Sports, Youth and Recreation (Ministère Provincial des Transports, Jeunesse, Sports, et Loisirs)

- PCR (*Police de Circulation Routièr* / Road Traffic Police).

Traffic management is urgently needed to mitigate traffic congestion by maximizing the utilization of existing transport facilities. Therefore, many government agencies, such as those in the road sector and public transport sector, as well as the traffic control sector are involved. Regarding traffic safety in Kinshasa City, CNPR is the particular authority for road safety while the PCR is in charge of the enforcement of laws and regulations for roads including traffic safety and control.

Table 7.1.5 shows the responsibilities of the agencies. A brief description of each agency is presented in Table 7.1.5.

Table 7.1.5   Traffic Management Responsibilities

Institution or Agency		Responsibilities	Engineering	Implementation	Operation& Maintenance	Education	Research
Ministry of Transport and Communication (MTVC, *Ministère des Transports et Voies de Communication*)	CNPR (Commission Nationale de Prevention Routière)	**Ensuring road security** ・Road safety audits ・Road safety education ・Axle load control ・Traffic accident data collection and analysis ・Surveillance of vehicles entering the country ・Implementation and control of traffic signals ・Supervision of traffic signs and markings ・Traffic law enforcement ・Intersection improvements ・Study and policy advice for road safety	XX	X	XX	XX	XX
	GET, Groupe d'Etudes des Transports)	・Collecting statistical data from commercial companies and public transport services (publication of transport statistics directories) ・Creating medium and long-term development plans for a national transport system					XX
MITPR, (*Le Ministère des Infrastructures et Travaux Publics et Reconstruction* / Ministry of Infrastructure, Public Works and Reconstruction)	CI	・Fundraising ・Setting up techniques and finance for projects ・Financial management ・Interface between MITPR and permanent structures/agencies under MITPR	XX				
	BEAU, Bureau 'Etudes 'Aménagement et 'Urbanisme	・Urban planning ・Designing urban roads and transport plans ・Organizing urban surveys	XX (Planning)				XX
	OR, Office des Routes	・Road planning, construction, and operation and maintenance of roads, rehabilitation and modernization of national and provincial roads	XX		XX		
	OVD, Office des Voiries & Drainage	・Planning, routine maintenance, construction, maintenance for roads and drainage of urban highways in major cities			XX		
	ACGT Agence Congolaise de Grands Travaux	・Managing finances and following up on road investments from China ・Studying multi-modal links of surface infrastructures ・Implementing and controlling	XX				

Institution or Agency		Responsibilities	Engineering	Implementation	Operation& Maintenance	Education	Research
		project investments (Chinese and private)					
PCR (*Police de circulation routière*)		・Traffic accidents ・Traffic law enforcement		Law enforcement XX			
CONADEP (*Commission nationale de délivrance des permis de conduire*)		・Driver's licenses ・Registration of commercial vehicles (taxis, trucks, etc.)		Law enforcement XX			
Government of Kinshasa City	Ministère Provincial du Plan, Travaux Publics et Infrastructures	・Developing provincial infrastructural policy ・Supervising implementation of provincial public works projects	XX				
	Ministère Provincial des Transports, Sports Jeunesse, et Loisirs	・Defining provincial transportation policies ・Issuing permits for public transport ・Issuing authorizations for the management and operation of car parks ・Fixing tariffs and transport routes ・Granting authorization agreements and monitoring organizations linked to technical control ・Designing and proposing edicts and decrees ・Applying penalties related to traffic offenses		Law enforcement X	XX		

Remarks:XX : Primary responsibility, X : Secondary responsibility

Source: The Study Team

b) Traffic Laws and Regulations

Traffic law in Kinshasa City is under the jurisdiction of national laws. The national government enacted Law No. 78/022 entitled the "New Highway Code" as a general traffic law on August 30, 1978. The Highway Code is the comprehensive road traffic law which describes road traffic regulations, traffic signals, traffic signs and markings, vehicle registration, driver's licenses etc. However, the Highway Code has not been revised since it was created, and this sometimes leads to misinterpretations related to penalties for traffic violations. Additionally, the Highway Code doesn't include current technologies or methods and does not correspond to international plans. Therefore, the CNPR submitted a draft of revisions corresponding to the "UN Decade of Action for Road Safety 2011-2020" to parliament and the proposed revisions are still under discussion.

There are four regulation types: *Loi* (Law) enacted by parliament, *Ordonnance* (Ordinance) enacted by the president, Edit enacted by Ville-Province, and Arrêté enacted by the National Minister or Provincial Minster. The National Commission of Road Prevention (CNPR) was instituted as the leading organization responsible for the management of road safety by ordinance No. 78/478 of December 26, 1978.

According to the Ministère Provincial des Transports, Sports Jeunesse, et Loisirs, the Arrêtés related to traffic management that are issued by the Provincial Minster are as follows:

- Large truck restrictions

- Parking rules, permission to use space for parking, and installation criteria

- Taxi and bus registration

- Transportation tariffs, etc.

Table 7.1.6   Democratic Republic of the Congo Legal System

Type	Loi (Law)	Ordonnance (Ordinance)	Edit	By-law
Organization	Parliament	President	City-Province	National Minister Provincial Minster

Source: Kinshasa City

c)   Traffic Safety, Control and Management Issues

The issues in organizations and institutions related to traffic safety, control and management are identified to be as follows.

Legacy laws and regulations

The Highway Code was enacted in 1978 and is considered an outdated law because it doesn't include current technologies or methods and does not correspond to international plans. Therefore, it is necessary to revise the law and other traffic regulations.

Ambiguity of responsibility

Though traffic signals, road lighting and roadside units are implemented by international donors during road construction, the responsibility of maintenance is not always clearly designated.

Qualified inspectors

There are not enough qualified inspectors to properly enforce traffic laws.

Financial problems

According to CNPR, the Grand Commission which consists of 21 organizations and authorities hasn't been held for a long time due to a tight budget situation.

(3) Public Transport Operations and Management

a)   Organizations and Institutions

There are multiple government and private agencies involved in the operation and management of public transport in Kinshasa City. The primary organizations are:

- CNPR (*Commission Nationale de Prévention Routière* / National Road Safety Commission)

- GET (*Groupe d'Etudes des Transports* / Transport Study Group)

- SCTP (*Société Commerciale des Transports et des Ports* / Commercial Society of Transport and Ports)

- TRANSCO (*Transports au Congo* / Transport in the Congo)

Table 7.1.7 below shows a matrix of the responsibilities of the agencies concerned.

Table 7.1.7   Responsibilities regarding Public Transport

Institution or Agency		Responsibilities	Policy Making & Planning	Infrastructure development	Regulation	Implementation	Operation& Maintenance	Education / Research
Premier Ministre	Comité de Pilotage de l'Organisation du Transport Urbain BCPSC, Bureau de coordination et suivi du programme Sino Congolais	·Steering the creation of public transport companies ·Managing finances and following up on road investments from China	X					
MTVC (*Ministère des Transports et Voies de Communication* / Ministry of Transport and Communication)	Direction d'Etudes, Recherche et Planification	·Studying, researching, planning and monitoring projects, transport sector statistics	XX					X
	SCTP, Société Commerciale des Transports et des Ports	·Railway operations ·Port operations ·River transport operations		XX (ports & railways)			XX (railways, ports & river transport)	
	TRANSCO, Transports au Congo	·Operation of bus service ·Study of bus service	X (study and planning of bus service)	X (bus depots)	X (TRASNCO bus routes)		XX (TRANSCO bus)	XX
	GET, Groupe d'Etudes des Transports	·Transport research ·Transport statistics						XX
	CNPR, Commission Nationale de Prévention Routièe	·Road safety audits, education & analysis ·Implementation and control of traffic signals, traffic signs and markings ·Axle load control ·Intersection improvements ·Traffic law enforcement		X (traffic signals & intersection improvements)	X (traffic signs & markings)	X		X (traffic safety & accidents)
	CONADEP, Commission nationale de délivrance des permis de conduire	·Driver's licenses ·Registration of commercial vehicles (taxis, trucks, etc.)			XX (driver's licenses & vehicle registration)			
	RVF, Regie des Voies Fluviales Congo	·Navigation of waterways of the Congo River			XX (river navigation)			

Institution or Agency		Responsibilities	Policy Making & Planning	Infrastructure development	Regulation	Implementation	Operation& Maintenance	Education / Research
MITPR	Cellule Infrastructure	・Fundraising ・Setting up techniques and finance for projects ・Financial management ・Interface between MITPR and permanent structure/agency under MITPR		XX (road)				
	OR, Office des Routes	・Road planning, construction, and operation and maintenance		XX (national road)			XX (national road)	
	OVD, Office des Voiries & Drainage	・Operation and maintenance of roads and drainage (except national roads)		XX (urban road)			XX (non-national road)	
	ACGT, Agence Congolaise de Grands Travaux	・Finance management ・Control and implement road investments from China or any other financing entrusted to it by the State		XX (road)				
	BTC, Bureau Technique de Contrôle	・Controlling techniques and finances at the execution stage on behalf of the government and the public companies ・Making revisions on the price variation form in the committee ・Updating general regulations for public procurement	XX		X			
	Direction d'Etudes et Planification	・Studying, planning projects, taking statistics in the transport sector	XX					X
Police Nationale Congolaise	PCR, Police de Circulation Routière	・Traffic accidents ・Traffic law enforcement				XX		
Government of Kinshasa City	Ministère Provincial des Transports, Sports Jeunesse, et Loisirs	・Permission for private bus ・Operation of NEW TransKIN ・Parking management (permission) ・Punishment of transport rule infractions ・Regulation of transport ・Technical matters in transport ・Conceptually formulating Edit and Arrêté ・Planning collaboration with planning division	X	X (depots)	XX (intra-city buses & taxies; revenue collection of river & air transport)	X (intra-city buses & taxis)	XX (NewTrans Kin)	
	Ministère Provincial du Plan, Travaux Publics et Infrastructures	・Road construction (urban roads)	X	XX (roads & bus stops)				
Private Bus and Taxi Operators	ACCO, Association des Chauffeurs du Congo	・Representation of private sector drivers ・Vocational training for drivers ・Insurance service					X (support drivers)	X (driver training)

Institution or Agency		Responsibilities	Policy Making & Planning	Infrastructure development	Regulation	Implement ation	Operation& Maintenance	Education / Research
	TRANSCO (Transports au Congo)	・Public bus operations (City and Inter-province), established by national government	X		negotiatio n with gov.	X Transco bus	X	X
	New Transkin	・Public bus operator (Kinshasa city) established by Kinshasa city	X		negotiatio n with gov.	X New Transkin bus	X	X
	APVCO, Association des Propriétaires de Véhicules au Congo	・Representation of drivers (owners) of *Esprits de Vie* buses			negotiatio n with gov. of *Esprits de Vie*		X (support drivers of *Esprits de Vie*)	X (driver training of *Esprits de Vie*)
	ANIPTMC, Association Nationale des Initiateurs et Propriétaires de Taxis Motos du Congo	・Representation of motorcycle taxi owners/drivers			negotiatio n with gov. of motorcycl e taxis		X (support drivers of motorcycle taxis)	X (driver training of motorcycle taxis)
	Bus & Taxi Drivers	・Drivers of road-based public transport					XX (buses, & taxis)	
	Bus & Taxi Owners	・Owners of road-based public transport vehicles					X (maintenanc e)	

Remarks:XX : Primary responsibility, X : Secondary responsibility

Source: The Study Team

b) Public Transport Operation and Management Issues

<u>Communication, Coordination and Cooperation among all transport modes</u>

In the public transport sector, there are many organizations involved at several levels: national, provincial, and public. The following issues are a result of insufficient communication, coordination and cooperation among the organizations concerned.

- No framework exists for coordinating the formulation and implementation of public transport plans
- Parallel permission for public transport routes given by the national and provincial governments
- No pricing linkages (e.g. no discount when connecting between public transport modes)
- No designated mechanisms/facilities for coordinating transportation modes transfers (e.g. no points/stations, no facilities, and no routes)

<u>Buses and Taxis</u>

- Single operation and regulation (e.g. by TRANSCO, by Provincial Minister of Transport)
- Discrepancies in responsibilities and implementation policies at the national and provincial

government[1] levels

- Excessive competition among national, provincial, and private bus operators caused by each service operating independently

- Lack of coordination between the regulatory authorities, mainly provincial and national governments, and the judicial authority: the police[2]

- Insufficient financial support for the bus operation organization (TRANSCO)

Unclear processes for setting fares and quality of service standards

Railways, Ports and River transport (SCTP)

- Single operation and regulation

- Insufficient financial resources and resulting managerial issues (e.g. unpaid salary)

- Insufficient staffing including an issue with aging personnel

- Unclear processes for setting fares and quality of service standards

7.1.8 Funding Issues

(1) DRC Government Financial Conditions

The size of the DRC government's budget has been changing rather drastically from year to year as shown in Table 7.1.8. Strong efforts were made by the Government to maintain functions in 2016 with a severely decreased budget. After the budget rebounded in 2017, it is expected to decrease again in 2018.

Table 7.1.8   DRC Central Government Budget

			2014	2015	2016	2017	2018
Recettes et Depenses	Revenues and Expenditures	CDF billion	8,273.40	8,363.20	6,694.50	11,301.70	10,313.30
% du PIB	% to GDP	%	37.90	23.00	16.74	23.80	12.90
Croissance budgetaire	Budget Increase	% p.a.	14.00	1.10	-21.00	68.80	-10.50
en USD	in USD	USD million	8,915.59	8,930.27	6,901.55	7,929.63	5,687.27

(Source: Ministere du Budget)

The DRC government underwent the Heavily Indebted Poor Country (HIPC) process[3] with the World Bank and the IMF (International Monetary Fund). It reached a Completion Point (CP) by 2010 and the implementation of debt reduction and rescheduling took place during the first half of the 2010s.

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[1] The national government is actually highly involved in spite of decentralization
[2] Leads to uncontrolled bus operations, especially dictating bus stop locations.
[3] The World Bank, the International Monetary Fund (IMF) and other multilateral, bilateral and commercial creditors began the Heavily Indebted Poor Country (HIPC) Initiative in 1996. The structured program was designed to ensure that the poorest countries in the world are not overwhelmed by unmanageable or unsustainable debt burdens. It reduces the debt of countries meeting strict criteria. The HIPC and related Multilateral Debt Relief Initiative (MDRI) programs have relieved 36 participating countries. As of 2018, 36 countries have received the full amount of debt-relief for which they were eligible through HIPC and the MDRI.

The World Bank and IMF approved irrevocable debt relief assistance to the DRC under the enhanced HIPC Initiative. The DRC is the 26th Regional Member Country (RMC) of the African Development Bank Group to reach the HIPC Completion Point and qualify for debt relief of USD 7,252 million in end-December 2002 Present Value (PV) terms, of which 1,009.7 million is from the World Bank Group.

The DRC Government went through a rescheduling of its public debt in 2014, which is reflected in the large decrease in the 2016 budget as shown in Table 7.1.9. However, the DRC Government started incurring new debt in 2017. The increased amount of public debt will reach 4.40% of the total budget with an 81.40% increase over the previous year. Cautious management of its public debt is required.

Table 7.1.9   DRC Central Government Public Debt

			2014	2015	2016	2017	2018
Dette Publiques	Public Debt	CDF billion	258.40	231.80	167.10	214.20	388.50
% des Depenses du Budget	% to Budget	%	3.50	3.10	3.10	2.10	4.40
Croisssance de la Dettes Publiques	Public Debt Growth rate	% p.a.	-43.70	-10.30	-15.20	28.20	81.40

(Source: Ministere du Budget)

As one of the Post-CP (Completion Point) countries, the DRC is in a better debt situation than other HIPCs and non-HIPCs; nevertheless, long-term debt sustainability will remain a challenge. Maintaining long-term debt sustainability will require efforts by the HIPCs and the international community to ensure prudent borrowing practices, suitable concessional financing, sustained and broad-based growth, a more diversified export base and increased access to markets in developed countries.

With regard to the transport sector budget, the major sources of public financing are the central government budget allocated to the MITPR (*Le Ministère de l'Infrastructure, des Travaux Publics et de la Reconstruction* / Ministry of Infrastructure, Public Works and Reconstruction) and the MTVC (*Le Ministère des Transports et Voies de Communication* / Ministry of Transport and Communication).

Additionally, there is a special earmarked account for road maintenance, the FONER (*Le Fonds National d'Entretien Routier de la République Démocratique du Congo* / National Road Maintenance Fund) which is a public administrative and financial institution created by Law No. 08/006-A of 7 July 2008. Fees charged on lubricants (CDF of USD 0.25 equivalent per litre) and fuels (CDF of USD 0.10 equivalent per litre) for use on land. Those royalties generate 98% of the total resources of the FONER. Table 7.1.10 explains how much FONER received and its receipt from Kinshasa on the far left column, and shows how those collected funds are allocated to other agencies, mainly to OR (*Office des Route*s / Road Agency) and OVD (*Office des Voiries et Drainages* / Office of Roads and Drainage). While annual fluctuations are observed, approximately 38 – 45% of revenue from the FONER is allocated for road maintenance in Kinshasa City.

Table 7.1.10   FONER Revenue and Expenditures

FONER	Revenue	Expenditure			Total	Balance
		OR	OVD	Others		
	a	b	c	d	e	f=a-e
2013 Kinshasa	41,502	8,342	8,721	21,790	38,853	2,649
Total	102,256	31,395	12,745	43,466	87,606	14,650
2014 Kinshasa	49,292	11,461	9,087	13,585	34,133	15,159
Total	118,803	37,888	10,632	43,431	91,951	26,852
2015 Kinshasa	32,264	8,440	5,770	8,908	23,118	9,146
Total	81,860	26,472	6,520	26,738	59,730	22,130

(Unit: USD 000)

(Source: FONER)

The total receipts (*recettes totales*) including general budget (*budget general*) allocated to each administration of the DRC Government, annex budget (*budgets annexes*) and special account (*comptes speciaux*) of the DRC Government planned in 2018 is approximately CDF 10 trillion (8,140 million USD assuming 1 USD = 1,267 CDF, August 2017) as shown in Table 7.1.11. However, approximately 82% of the total receipts (*recettes totales*) were executed in 2016 according to the *Ministère du Budget*.

In terms of the national budget for the transportation sector, the sum of MITPR and MTVC allocations and FONER receipts accounts for 9% of the total funding over a five-year average, though there are annual fluctuations. It should be noted that this amount includes the budget for the communication sector and labour costs for government agencies.

Table 7.1.11   Central Government Budget and Transport Sector Allocations

[Unit: CDF million]	Plan 2014	Plan 2015	Plan 2016	Plan 2017	Plan 2018
MITPR	153,636	285,163	197,810	1,565,096	402,046
MTVC	97,840	342,539	107,082	142,385	280,796
FONER	91,941	110,335	113,860	168,536	264,322
Sub-total of Transport Sector	343,417	738,037	418,752	1,876,017	947,164
Share of Transport Sector	4%	9%	5%	16%	9%
Total Receipts*	8,273,434	8,496,350	8,476,362	11,524,535	10,313,286

Note: * Total receipts (*recettes totales*) includes general budget (*budget general*) allocated to each administration of the Central Government, annex budget (*budgets annexes*) and special account (*comptes speciaux*). Special account (*comptes speciaux*) includes the FONER.

Source: Ministère du Budget, edited by the Study Team

In terms of the regional budget allocation, approximately 15% of the amount distributed to all provinces goes to Kinshasa Province, as shown in Table 7.1.12.

Table 7.1.12   National Budget Allocations to Provinces

[Unit: CDF million]	Plan 2014	Plan 2015	Plan 2016	Plan 2017	Plan 2018
Kinshasa	281,821	266,460	264,864	280,723	279,498
Share of Kinshasa	16%	13%	15%	15%	15%
Total of Provincial Governments	1,795,041	2,033,648	1,793,358	1,900,740	1,892,443

Source: Ministère du Budget, edited by the Study Team

(2) Financing from International Donors

The latest strategy available from the World Bank Group is described in CAS (the Country Assistance Strategy) for the FY (fiscal year) 2013 – 2016 which will be followed by a new Country Partnership Framework for 2018-2021. The FY2013 CAS addressed the challenges of stabilization and peace consolidation in the East, regional integration as an opportunity to boost economic growth and create jobs, and improving competitiveness to accelerate private sector growth and employment as its strategic pillars. Transport sector projects / programmes in the CAS FY2013 are summarized in Table 7.1.13.

There are no active World Bank Group transport sector projects / programmes in Kinshasa City as of May 2018. During the last decade, over USD 400 million in projects and programmes were pledged. World Bank Group's planned "Kinshasa Urban Development and Resilience Project" is discussed in Section 7.4.

Table 7.1.13   List of Active World Bank Transport Sector Projects / Programmes

Project/Programme		Location	Start	End	Inst.	Amt (USD M)	Rating	Notes
ID	Name							
LENDING/NON-LENDING								
P101745	Pro-Routes: High Priority Reopening and Maintenance	Sud Kivu, Katanga Orientable provinces	2008	2008	IPF	50	S	
P120709	Pro-Routes Project- AF Grant	+ Equateur	2011	-	SIML	63.3	-	
P153836	Pro-Routes Project – 2nd AF	-		2016	-	IPF	125	-	
P129713	Urban Development	Bukavu, Kalemie,	2013	2022	IPF	100	MS	
P157114	Urban Development - AF	Kikwit, Kindu, Matadi, and Mbandaka cities	2017	-	IPF	90	IPF	

Source: the World Bank Group, edited by the Study Team as of May 2018

Note: 'Inst.' = instrument, 'Amt' = amount. 'USD M' = million USD, 'IPF' = Investment Project Financing, 'SIML' = Sector Investment Maintenance Loan, 'AF' = Additional Financing, 'S' = Satisfactory, 'MS' = Moderately Satisfactory.

The latest available AfDB (African Development Bank) Group strategy is described in the FY2013 CSP (Country Strategy Paper). The FY2013 CSP targeted natural resources and geo-strategic positioning in order to be more conducive to regional integrational benefits, though these were not successful. As agriculture employs 70% of the population and produces 40% of GDP, it emphasises greater development of this sector. It recommended support for a very small number of enterprises (9,000, of which 80% are SMEs, small and medium-sized enterprises),

concentrated in Kinshasa and in other urban areas. Another strategy mentioned in the CSP was developing infrastructure to support private investment and regional integration and capacity building of the State. From 2012 to 2015, UAC[4] 198 million (equivalent to USD 279 million as of August 2017) in transport projects and programmes were pledged (as shown in Table 7.1.14). Meanwhile the only project listed for Kinshasa City is the challenging Brazzaville – Kinshasa Rail – Road Bridge Construction project.

Table 7.1.14   List of Active and Planned AfDB Transport Sector Projects / Programmes

Project/Programme	Location	Start	End	Inst.	Amt (UAC M)	Notes
LENDING						
Projet de réhabilitation de la route Batshamba-Tshikapa-Loange Bridge-Lovua Bridge Section-Lot 2	Western Kasai	2012	-	G	54	
Prpjet de réhabilitation de la route Batshamba-Tshikapa-lot 3		2015	-	L	56	
Projet d'aménagement de la route Batshamba-Tshikapa-Section Lovua-Tshikapa (56 KM)		2014	2018	G	13	
				L	1	
Projet d'aménagement de la route nationale 1 (Tshikapa-Mbuji-Mayi) et de construction des infrastructures ruales	Eastern Kasai/Western Kasai/Katanga	2015	2019	G	74	
Brazza ville-Kinshasa Rail-Road Bridge Construction (Congo-RDC)-Planned	Regional	-	-	-	35	No info From CSP

Source: the AfDB Group, edited by the Study Team as of May 2018

Note: 'Inst.' = instrument, 'Amt' = amount, 'UAC' = unit of account for the AfDB which is a virtual currency utilized for accounting purpose of the AfDB, 1 UAC is equivalent to 1.40775 USD and 151.173 JPY in August 2017, 'G' = grand, 'L' = loan.

(3) Transport Sector Finance Issues in Kinshasa City

Although the availability of information on the budget is limited, the executable budget for the urban transport sector of the Study Area is estimated at approximately CDR 171 billion in 2018 (equivalent to USD 135 million, exchange rate of August, 2017).[5] While this is larger than the estimated required budget for road maintenance for the current road network of the Study Area, CDR 142.2 billion (USD 90 million)[6], limited infrastructure development is expected. According to FONER, their 2016 national budget was USD 128 million; whereas they estimated annual total requirements for road maintenance to be almost double that amount, at approximately USD 250 million. It also should be noted that Transco is receiving assistance from the government in the form of vehicles and fuels; and that the railways department of the SCTP receives cross subsidies

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4 'UAC' or 'XUA' registered as ISO 4217 stands for unit of account for the AfDB which is a virtual currency utilized for AfDB accounting purposes. 1 UAC is equivalent to 1.40775 USD and 151.173 JPY in August 2017.
5 The MITRP and MTVC budgets in 2018 are CDR 402,046 million and CDR 280,796 million, respectively. It is assumed that 15% of these are allocated to the Study Area based on the provincial budget allocation (Table 7.1.12). Additionally, the 2018 FONER budget is 264,322 as shown in Table 7.1.11. It is assumed that 40% of this will be allocated to the Study Area based on budget allocations to the Kinshasa City area from 2013 to 2015 as shown in Table 7.1.10. A budget execution ratio of 82%, which is observed in 2016, is applied.
6 Based on the road inventory survey (RIS) results, road area was estimated. 2% of unit cost for construction of road described in Section 7.8.2 is applied.

from other departments and headquarters. According to the CNPR, the Grand Commission which consists of 21 organizations and authorities hasn't been held for a long time due to a tight budget situation. Considering the budget shortfalls in all transport sub-sectors, funding for initial investment, maintenance and operations needs to be increased. Additionally, the efficiency of each government agency should be improved.

In terms of financing from international donors, as of May 2018 the only expected funding from multi-lateral donors in Kinshasa are from the World Bank for the planned Kinshasa Urban Development and Resilience Project, and from the AfDB for the Kinshasa – Ilebo Railway Project including the construction of Brazzaville – Kinshasa Rail – Road Bridge.

Proper execution of the allocated budget is also an issue in the DRC. In 2016, only 82% of the governmental budget or total receipts (*recettes totales*), was executed. As for the FONER budget, a comparison of the planned budget and End of Fiscal Year Figures reveals some gaps. For 2015, it planned CDF110 billion, but its receipts ended up at only CDF 53 billion (48%). In 2016 this figure went up to 89%. Furthermore, the FONER has had difficulties mobilizing resources and verifying that charges are levied on all imported fuels. With a view to strengthening its financial resources, the FONER has been considering introducing a "Vignette" system[7]. In addition to FONER, further financial funds are expected to be invested in infrastructure development, proper maintenance, and operation and management of roads and public transport.

7.1.9   Environmental Issues

From field observations and discussions with the Stakeholders, present environmental vulnerabilities of Kinshasa City that require attention in future transport development scenarios can be summarized as shown in the following table.

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[7] A pricing scheme for road users typically using a small coloured label which is affixed to a front window of a vehicle. Time-based pricing is applied instead of distance based. This scheme is mainly observed in European countries as the share of foreign vehicles is higher.

Table 7.1.15   Urban Transport Issues with Environmental Impacts in Present Kinshasa City

	Impacts Related to Road and Transportation
Environmental Pollution	• Most of the vehicles are reasonably well-maintained, but occasionally vehicles with **black or white exhaust** are observed. • Unpaved roads and ground surface are among **the main causes of dust** in the dry winter season. • **Heavy road congestion** at various places in the Study Area is contributing to **air pollution**.
Natural Environment	• Many arterial and secondary roads have **grown street trees** that provide shade, mitigate dust pollution, and give town identity to local people. **Public and private trees may be lost** due to new roads or urban development.
Socio-Economic Environment	• Many arterial and secondary roads are poorly maintained and remain in a condition where **car access is difficult**. Individuals living along such roads are **forced to walk**. • Large numbers of pedestrians are at **high risk of traffic accidents** because of insufficient provision of pavement, street lights and road crossing facilities. • Public transport is well-used, but not well-organized or disciplined. The general public is **forced to pay higher fares** on many occasions. • Heavy road congestion is observed at major intersections, markets, potholes, and where the traffic volume surpasses the road capacity. Such **congestion is the reason for many socio-economic deficiencies**, such as unpredictable public transport, large number of commuters forced to walk, and **loss of personal time and economic opportunities**.

Source: The Study Team

7.2   Objectives of Urban Transport

Through discussion in JCC (Joint Coordinating Committee) and TWG (Technical Working Group) of the study, four objectives were set for the urban transport system in the Study Area toward 2040: 1) Supporting Urban Economic Activities, 2) Assuring Equity in Transport, 3) Improving Safety and Security, and 4) Achieving Environmentally Sustainable Transport.

Source: The Study Team

Figure 7.2.1   Four Objectives for Urban Transport in the Study Area

(1) Supporting Urban Economic Activities

Transport is derivative of economic activities. However, economic activities are totally dependent on passenger and cargo transport in contemporary urban areas. Obstacles in transport significantly affect economic growth of both the city and the nation. As a capital city, dysfunction of Kinshasa City means dysfunction of administration and economy of the entire DRC, a country with an area comparable to that of Western Europe. It also should be noted that Kinshasa City has been a national and African transport network hub due to its strategic geographical location connecting land transport toward Atlantic Ocean and fluvial transport toward inland areas.

Unfortunately, the transport system in the Study Area is currently a bottleneck for economic activity. Low travel speeds caused by unpaved roads and traffic congestion results in economic losses through higher travel time costs for workers and non-workers. Transport costs for goods are also affected by these low speeds, and the poor road conditions often damages the quality of goods.

The transport system of the Study Area should serve as a stable, resilient and high-capacity circulatory system of Kinshasa and the entire DRC to support economic activities. With the improved transport system, travel time of passengers and goods reduces. This expands labour and goods market of the populous city of Kinshasa, and, this increases productivity of industries in the city. The reliable and predictable travel time minimize required costs for transport. The roads without holes and bumps and the well maintained railway tracks reduce the loss of goods during transport.

(2) Assuring Equity in Transport

Regardless of income level, age, gender, disability, vehicle availability or any other personal attribute, residents should have transport modes available to facilitate their daily activities of

working, studying, eating, shopping, and caring for their health. In this sense, transport is a fundamental right for people. Restricted mobility results in reduced accessibility to job opportunities, education and medical services.

Under the status quo, Kinshasa City is physically divided by rivers, hills and the poor condition of roads. Additionally, there is a significant gap in mobility between people with and without automobiles. For public transport users, there is no barrier free option except for hiring a taxi or a motorcycle taxi. As a right of people in the DRC, the government should provide a reliable and accessible public transport system.

With the improved transport system, all residents in the city have access to key functions of daily activities as described above regardless of any personal attributes and location in the city. This means that all people who wish to work can access a significant number of job opportunities, and, all children in the city have access to educational facilities including higher education. It should be noted that improvement of education further increases the productivity of workers.

(3) Improving Safety and Security

Safety and security in transport is a concern for all, including pedestrians, drivers, and passengers. Although traffic accidents can never be completely eliminated, even in developed countries, continuous effort is required to minimize accident risk. Crimes related to transport also should be taken into account.

There is, however, minimum control of traffic in the Study Area. The vehicle inspection system is not fully functioning, resulting in high accident fatality rates. Lack of control over public transport service also puts passengers at risk.

With the policies of the urban transport master plan, the number of traffic accidents can be minimized while it cannot be completely eliminated. In addition, the number of fatalities from one traffic accident can be reduced with various safety measures even if traffic accidents happen.

(4) Achieving Environmentally Sustainable Transport

Urban transport systems are expected to be environmentally sustainable. Without this, cities will not be able to be sustainable in the future. While it is not possible to completely remove all negative environmental and social impacts, they should be reduced or mitigated to a sustainable level.

Most vehicles in Kinshasa City (and throughout the DRC) are imported and used, and are often sub-standard in terms of greenhouse gas and pollution emissions. Use of electricity and alternative fuels such as LPG (Liquefied Petroleum Gas) and CNG (Compressed Natural Gas) is limited. Inspection and maintenance programmes and vehicle registration procedures are insufficient.

Therefore, implementation of the master plan should reduce noise and emission of pollutants from transport systems. It also should contribute to decelerate global warming by reducing emission of greenhouse gases. Social impacts of the master plan implementation such as involuntary relocation also should be minimized, and, necessary mitigation measures should be taken.

7.3 Urban Transport Policies

Based on the nine urban transport issues and four urban transport objectives discussed in the previous sections, nine urban transport policies are formulated. The relationships among the issues, policies, and objectives are summarized in Figure 7.3.1.
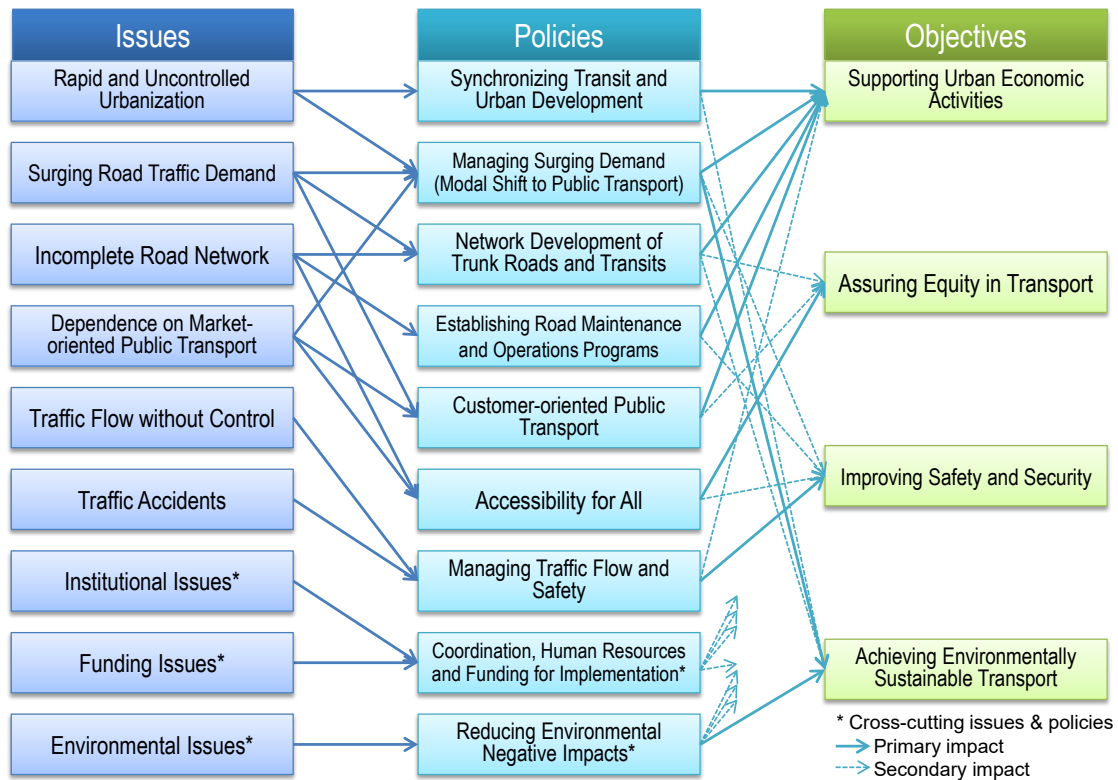
Source: The Study Team

**Figure 7.3.1   Transport Issues, Policies and Objectives for the Study Area**

7.3.1   Synchronizing Transit and Urban Development

"Transit and land-use integration is one of the most promising means of reversing the trend of automobile-dependent sprawl and placing cities in developing countries on a sustainable pathway."[8] By introducing high density and mixed-use land uses along high capacity transit corridors, urban lifestyle based on non-motorized transport and public transport can be achieved along the transit corridor. This significantly reduces use of a car, trip lengths and emission of greenhouse gases and air pollutants. In addition, public transport can capture higher ridership due to the transit-oriented lifestyle of people along the transit. Urban policy makers in the developing world are now paying more attention to this TOD (Transit-Oriented Development) concept. In other words, high-capacity public transport projects such as railways might fail without intensive

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[8] Suzuki, Hiroaki, Robert Cervero, and Kanako Iuchi. 2013. Transforming Cities with Transit: Transit and Land-Use Integration for Sustainable Urban Development. Washington, DC: World Bank. DOI: 10.1596/978-0-8213-9745-9 License: Creative Commons Attribution CC BY 3.0. p.3

transport demand.

As discussed in 7.1.2, motorization is the inevitable side effect of economic growth in urban areas. Like most cities in the developing world, Kinshasa City could become dependent on private modes of transport, especially personal cars. Images of a car-oriented city and a transit-oriented city are illustrated in the Figure 7.3.2. Urban areas of car-oriented cities usually are diffused to their outskirts. The density of suburban areas as well as the core of the city is lower than those of transit-oriented cities. The number of urban centres also tends to be limited. On the other hand, urban functions are concentrated along the transit corridor especially in the vicinity of transit stations. In the vicinity of a transit station, mixed-use land use is enhanced. Thus, urban activities such as business and commercial activities are also observed to cluster along the transit corridor. Photo images exemplifying typical transit-oriented and car-oriented cities are shown in Figure 7.3.3 Transit-oriented cities show higher density, more frequent transit trips and fewer vehicle-kilometres compared with car-oriented cities as summarized in the Table 7.3.1.
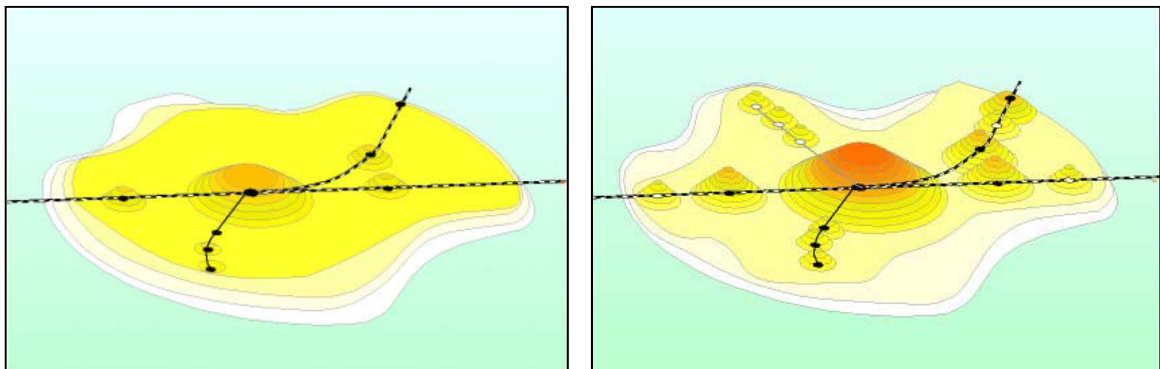
Transit-oriented City with Multi-Core

Source: the Ministry of Land, Infrastructure, Transport and Tourism, Japan, edited by the Study Team

Figure 7.3.2   Concept of the Car-Oriented City and the Transit-Oriented City

Houston,
Example of the
Car-oriented City

Curitiba,
Example of the
Transit-oriented City

Source: Presentation by Cervero, R. Online. Internet. Available at 5th July, 2018
https://umanitoba.ca/faculties/management/ti/media/docs/cervero_-_5Ds_and_transit-Winnepeg-Nov2011.pdf
edited by the Study Team

Figure 7.3.3   Photo Images of the Car-Oriented City and Transit-Oriented City

Table 7.3.1   Key Index of a TOD City and a Road Intensive City in Brazil

Index	Public intensive with TOD City of Curitiba	Car-oriented City of Brasilia
Persons/km^2	3,470	420
Transit trips/capita/year	355	97
Vehicle-kilometre/capita/year	7,900	16,700

Source: Presentation by Cervero, R. (2011) Online. Internet. Available at 5th July, 2018
https://umanitoba.ca/faculties/management/ti/media/docs/cervero_-_5Ds_and_transit-Winnepeg-Nov2011.pdf
edited by the Study Team

The '5Ds' proposed by Cervero, R. and Kockelman, K. are considered to be key elements of designing built environment for the TOD. In the area with walkable Distance to transit, introduction of Dense and Diverse land uses with pedestrian-friendly street Design considering access time to their Destination is considered essential for successful implementation of TOD as shown in Figure 7.3.4. This build environment enhances modal shift to transit and decreases vehicle kilometres per capita.
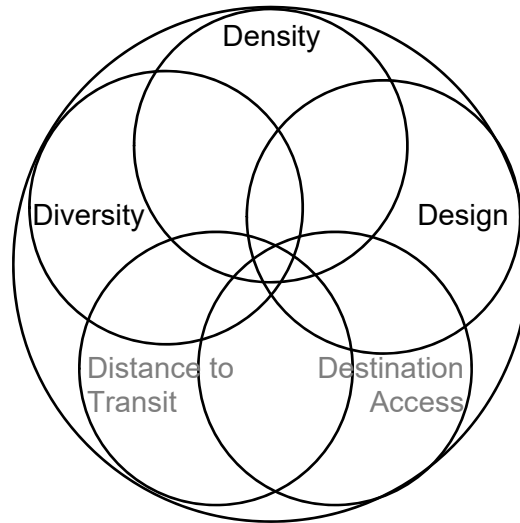
Source: Source: R. Cervero & K. Kockelman, Travel Demand and the 3Ds: Density, Diversity, Design, Transportation
      Research, 1996

Figure 7.3.4   5Ds of Transit-oriented Development

Typical example in the developing country is Curitiba's Trinary Road System. The areas within a few hundred meters from the structural axis of BRT (bus rapid transit) system, high FAR (Floor Area Ratio) and building height is allowed for mixed-use purpose. Relatively lower FAR, low building height residential land use is applied for the area far from the structural axis of the BRT.
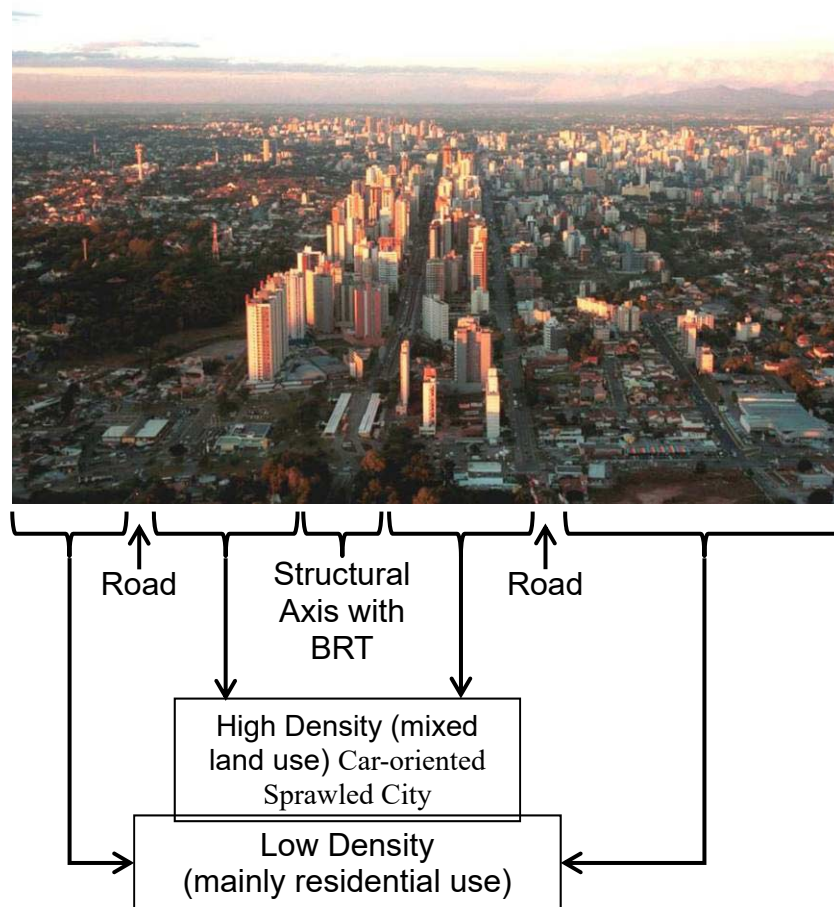
Figure 7.3.5   Curitiba's Trinary Road System

In the current urbanized area of Kinshasa City, provision of higher FAR in areas around railway and BRT stations is required to facilitate TOD. Legal and institutional frameworks to enforce these regulations are also needed. Another option in the urbanized area is the urban redevelopment which usually constructs new buildings with higher FAR in the area close to a transit station by exchanging land ownership rights with floor ownership of the planned building. Examples of urban redevelopment are shown in Figure 7.3.6 and Figure 7.3.7. It should be noted that infrastructure development such as roads, parks, bus terminals, sewage and water supply also can be included in the urban redevelopment project as the increase of FAR in the urbanized area generates increased property values. Integrating the spatial design of bus stations and the surrounding area can improve relating functions, such as neighbourhood commercial and transit station services, and amenities for bus passengers.

| Integrated development with subway station (Bangkok, Thailand) | Urban redevelopment with station / commercial building (Bangkok, Thailand) |

Source: Nine Steps Corporation

Figure 7.3.6   Example of Urban Redevelopment Integrated with Railway Station Development in Bangkok, Thailand

Source: Urban Renaissance Agency. Online. Internet. Available on 9th July, 2018 at
https://www.ur-net.go.jp/produce/case/case006.html

Figure 7.3.7   Example of Urban Redevelopment in Conjunction with Station Square Development in Sayama, Japan

As discussed in Chapter 6, new urban centres are planned for the currently suburban areas of N'sele commune, the south of Kimbanseke commune, and to the west and south of Mont-ngafula commune. These new urban centres should be built as transit-oriented developments. Thus, the urban transport network scenario should be consistent with the urban development scenario selected in the Chapter 6. Figure 7.3.8, Figure 7.3.9 and Figure 7.3.10 show an example of the TOD in Japan at Seishin-Chuo Station. Higher BCR (Building Coverage Ratio) and FAR are allowed in the commercial and residential zones around the railway station which was constructed simultaneously with the new town development. It is also evident that the urbanization promotion area, coloured zone in the Figure 7.3.8 and surrounded by the pink line in the Figure 7.3.9, is clearly defined; and urbanization in other areas (urbanization control area) is restricted.

Category of Land Use Zones	BCR	FAR
Exclusively low-story residential zone	40	80
	50	100
Residential zone	60	200
	60	300
Exclusively medium-high residential zone	60	200
Neighbourhood commercial zone	80	400
Commercial zone	80	400
Quasi-industrial zone	60	200
Exclusively industrial zone	60	200

☐ Zone with High Density around railway station
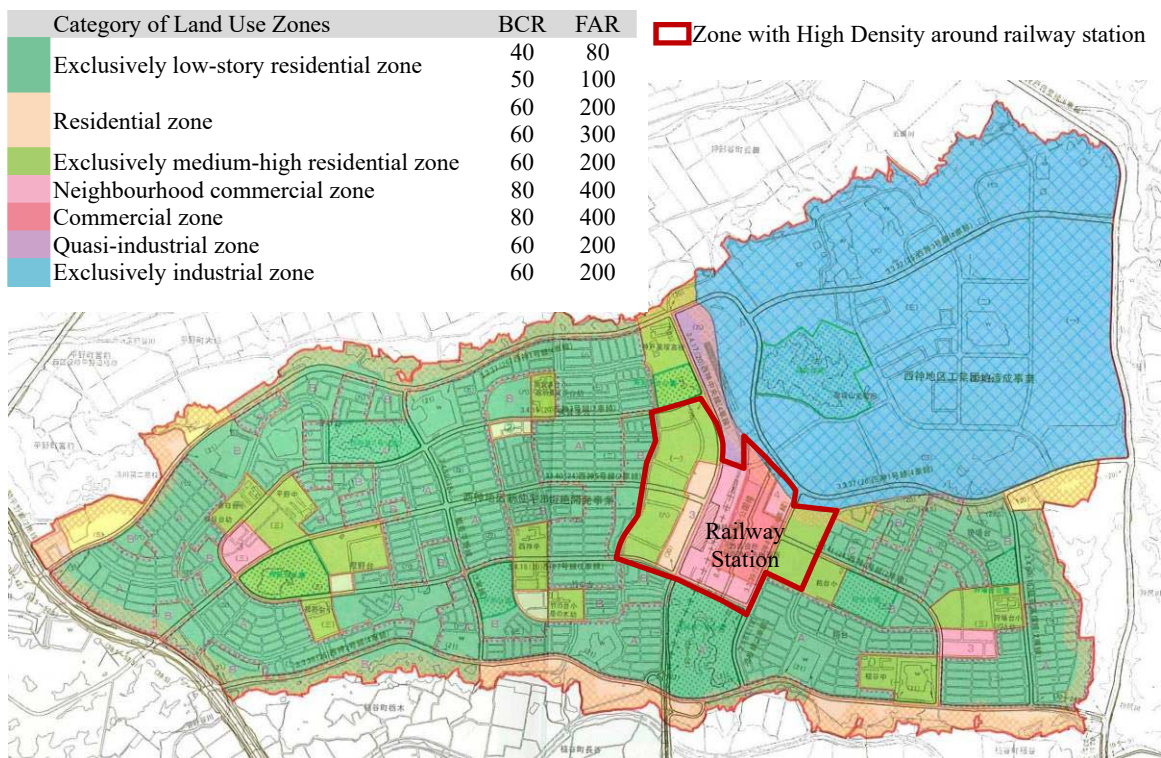
Source: Kobe City, edited by the Study Team

Note: BCR stands for Building Coverage Ration. FAR stands for Floor Area Rataio.

Figure 7.3.8   Zoning, FAR and BCR of Area around Seishin-Chuo Station, Kobe, Japan
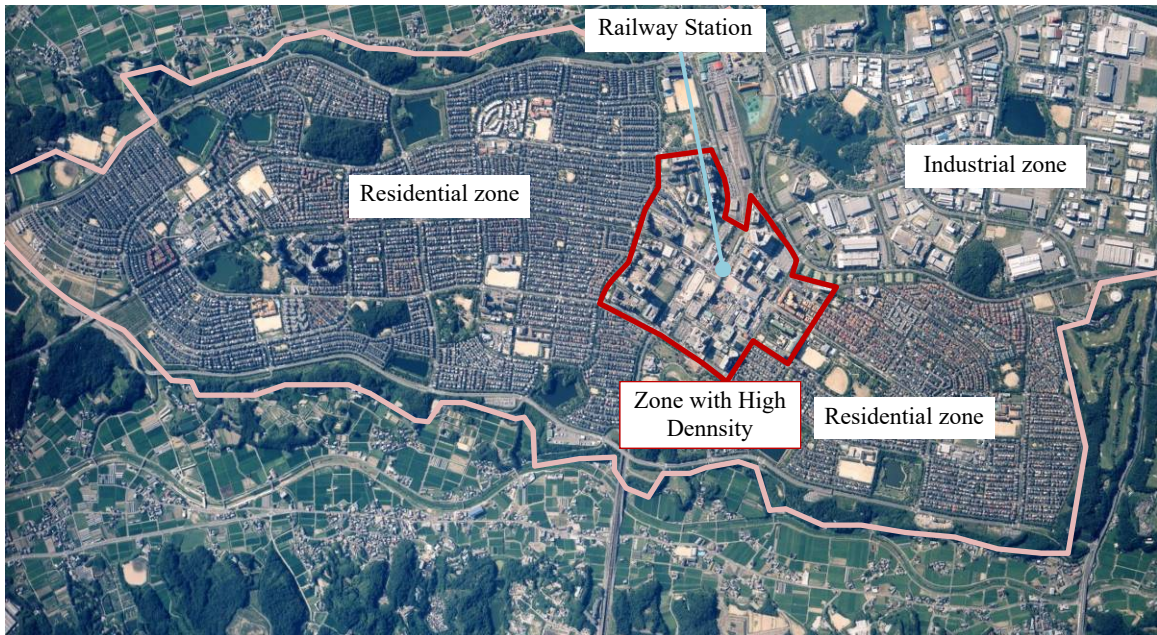
Source: Kobe City, edited by the Study Team

Figure 7.3.9   Aerial Photo of Area around Seishin-Chuo Station, Kobe, Japan
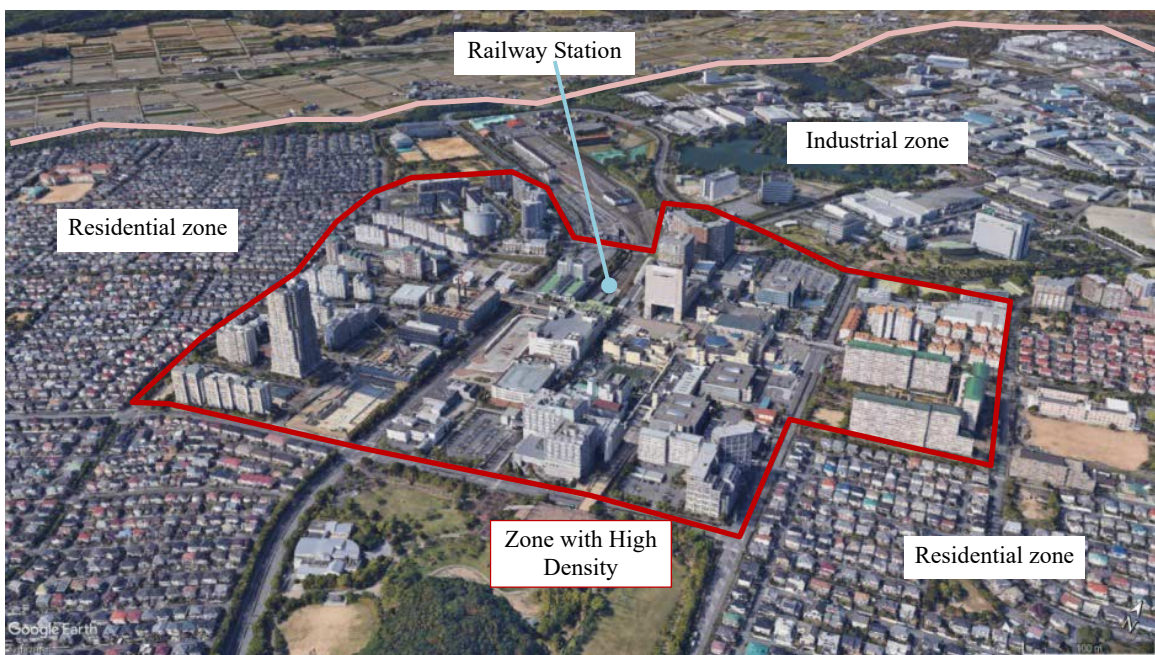
Source: Google, Zenrin 2018, edited by the Study Team

Figure 7.3.10   3-Dimentional Image of TOD around Seishin-Chuo Station

With the development of a transit system and the provision of higher FAR in the areas close to the transit stations, land values are increased. This added value can be captured by several methods

such as developing or selling properties by transit operators, granting development franchise rights, and fees and taxes. This concept, called land value capture, is one of the key funding sources from the private sector. The details of land value capture will be discussed in Section 7.3.8.

7.3.2   Managing Surging Demand (Modal Shift to Public Transport)

Since unprecedented motorized travel demand is expected in Kinshasa City in the near future as discussed in Section 7.1.2, a high-capacity transport system to be able to accommodate the demand is required. The capacity of private modes of transport such as passenger cars is significantly lower than that of public transport. Figure 7.3.11 illustrates the road space required to carry the same number of passengers transported by a car, a motorcycle and a bus. It is evident that passenger cars occupy significantly more road space than buses, and the capacity of railways is even larger than that of buses.

It should also be noted that many cities in emerging countries have experienced the vicious circle of motorization. The more the government invests in roads, the more people use cars along with economic development. On the other hand, road-based public transport modes such as buses lose their passengers as traffic congestion worsens. This further deteriorates traffic congestion due to modal shift to private modes from public transport modes. This is why immediate action should be taken to terminate the vicious circle of motorizations. Considering the limited urban space and financial resources of Kinshasa City, it is not feasible to rely only on private modes of transport and road network development.

Source: Poster of the State of North Rhine-Westphalia, seen in Muenster, Germany, sited by Petersen, R. and additional contributors of Wuppertal Institute (2004) in "Land Use Planning and Urban Transport", edited by GTZ.

Figure 7.3.11   Comparison of Road Space Required by Modes to Carry the Passengers of One Bus

There are several public transport modes with various characteristics. Figure 7.3.12 shows the transport capacity and scheduled speed of different public transport modes, which are considered as key indicators for selecting the public transport mode. The current public transport modes in the Study Area (buses, minibuses, taxi-buses and shared taxis) have the smallest capacity and slowest

travel speeds among all public transport modes. Taking the surging travel demand into consideration and required modal shift to public transport modes, the modes with higher capacity and speed are indispensable.
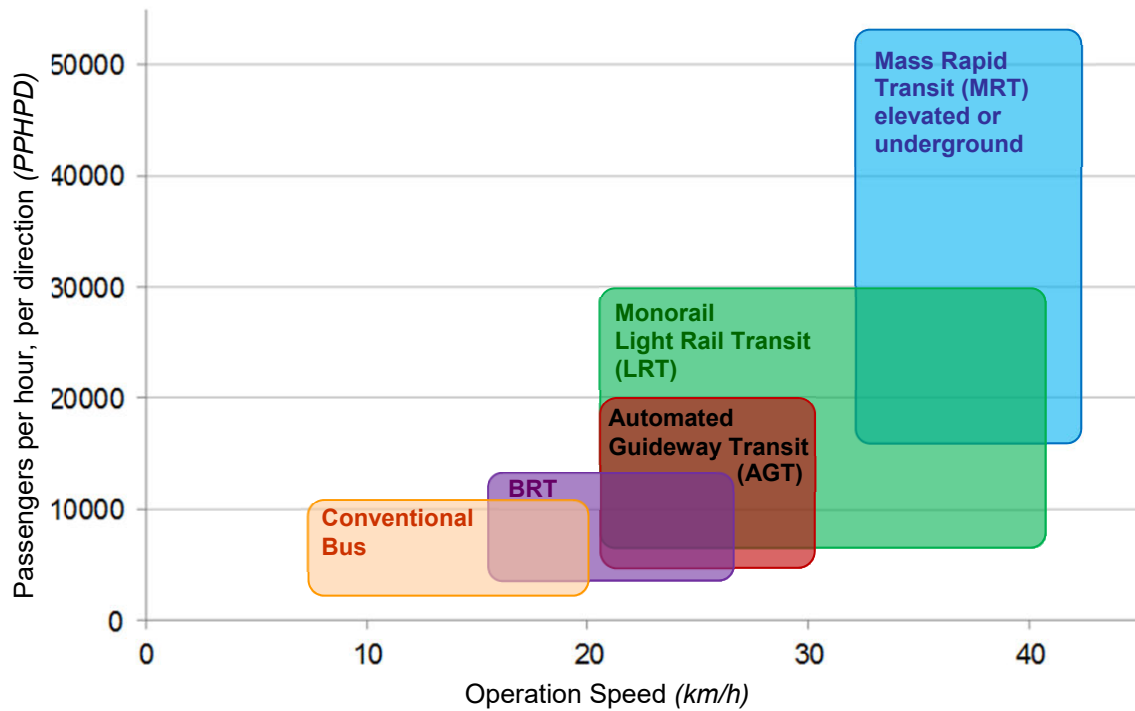
Source: Urban Transport System Development Project for Colombo Metropolitan Region and Suburbs (2014), based on the information from the Ministry of Land, Infrastructure, Transport and Tourism, Japan

Figure 7.3.12   Passenger Capacity and Scheduled Speed of Public Transport Modes

ESCAP (The United Nations Economic and Social Commission for Asia and the Pacific) summarized transport options by a development stage and a size of a city as shown in Figure 7.3.13. While the improvement of environment for a non-motorized transport is suggested for a city over 5 million population in the least developed countries, it is proposed to shift to develop rail-based transport along with economic development. Considering the future projected population of over 25 million, exclusively bus-based transport is not capable in serving the surging travel demand.
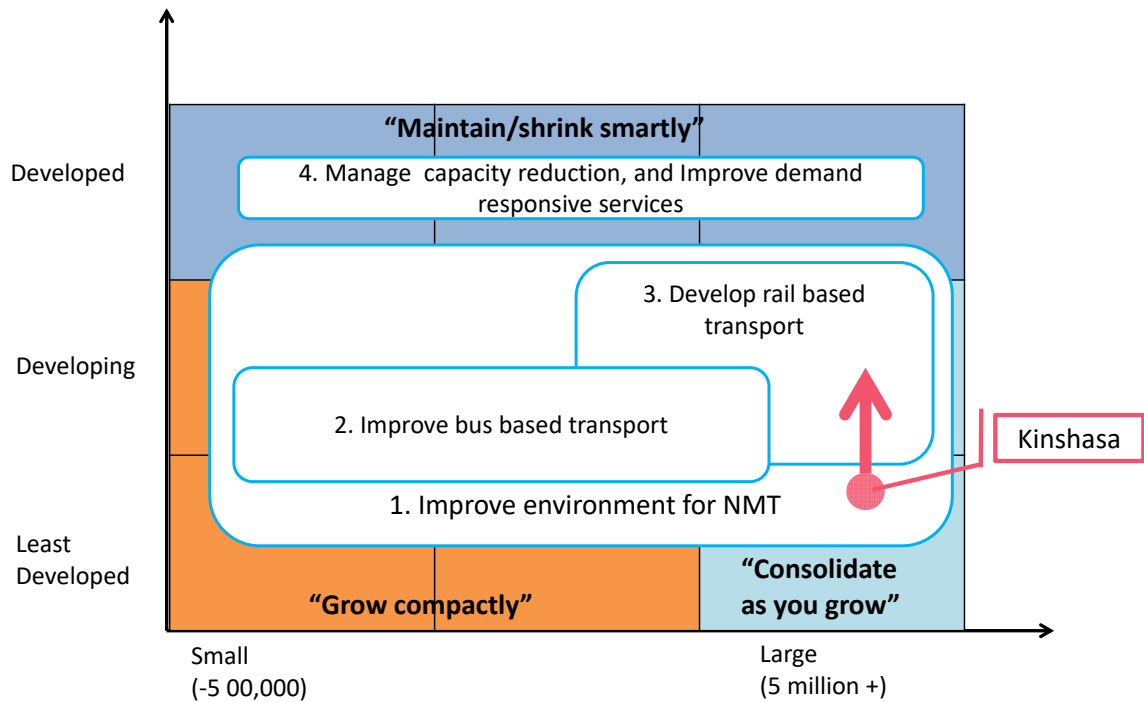
Source: Holger Dalkmann and Ko Sakamoto (2012) Low Carbon Green Growth Roadmap for Asia and the Pacific [Background Policy Paper] : Urban Transport: Policy recommendations for the development of eco-efficient infrastructure, ESCAP (The United Nations Economic and Social Commission for Asia and the Pacific), 2012, page v, Online. Internet. Available on 8th July 2018 at https://www.unescap.org/sites/default/files/7.%20Urban-Transport.pdf edited by the Study Team

Figure 7.3.13   Priority Transport Policies for Cites by a Development Stage and a Size

The JICA's Research on Practical Approach for Urban Transport Planning revealed that most cities in the developing world commenced their metro, or urban railway service, when their GRDP (gross regional domestic products) reach USD 3 to 30 billion as shown in the Figure 7.3.14. The Kinshasa City has already reached this range, and it is expected to exceed it by the year of 2040.
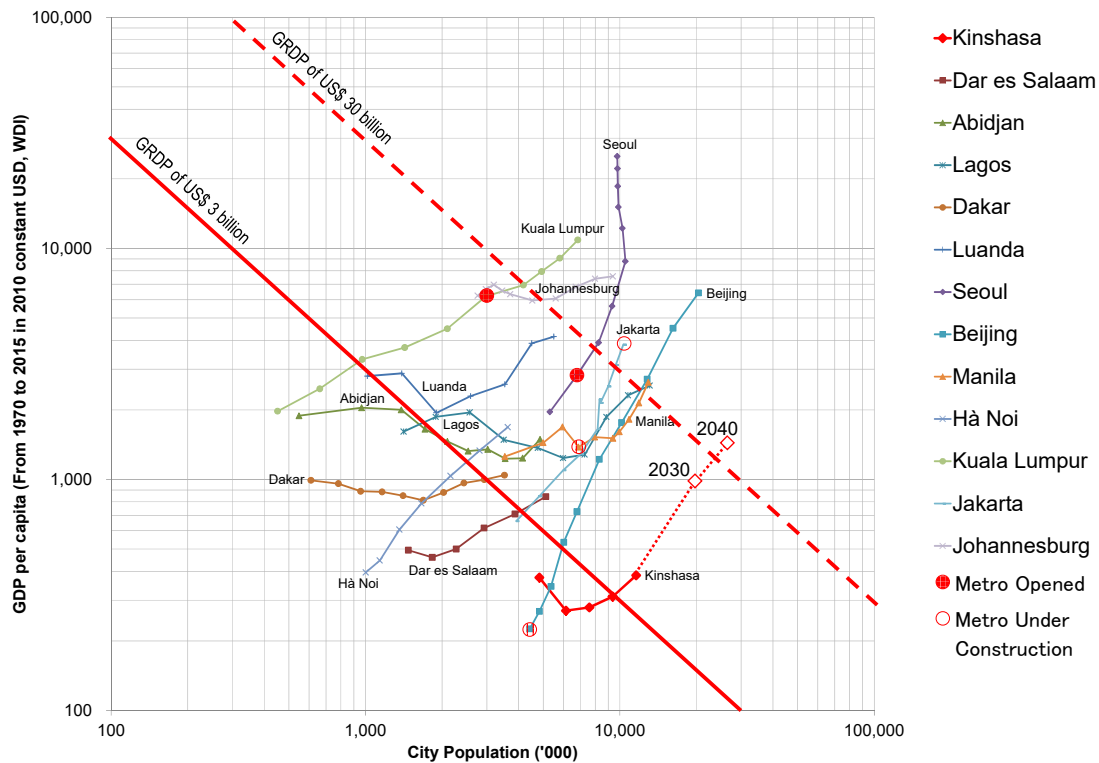
Source: JICA and Almec Corporation (2011) " The Research on Practical Approach for Urban Transport Planning",
        edited by the Study Team

Note: Major African and Asian benchmark cities are selected. 2030 and 2040 values of the Kinshasa City are projection
      by the Study Team

Figure 7.3.14   Opening of Urban Railway System by GDP per Capita and by City Population

In addition to the discussion on transport capacity and speed, various aspects of public transport
modes are summarized in the Table 7.3.2. One of the critical features of public transport which
should be considered in Kinshasa City is a cost for initial investment, operation and maintenance
due to financial constraint discussed in Section 7.1.8. As discussed above, it is essential to
introduce public transport modes with high capacity such as a railway. However, the underground
mass rapid transit, which does not affect road capacity and requires minimum land for
development, is not feasible option due to the highest initial cost required. A financially
sustainable option should be taken into account for continuous operation of a transit system.

In terms of public transport modes with medium capacity such as LRT (Light Rail Transit),
monorail, AGT (Automated Guideway Transit) and BRT (Bus Rapid Transit), the BRT is the most
efficient considering required cost and capacity. However, it should be noted that the BRT requires
two lanes of roads exclusive for the BRT system while flexible operation can be applied such as
partial open-system lane which allows other private modes to use the BRT lane.

The further detail examination considering the projected transport demand and transport network
scenarios are described in Section 7.8.

Table 7.3.2   Characteristics of Urban Public Transport Modes

System	Bus*	BRT	AGT	Monorail	LRT	MRT - Elevated	MRT - Underground
Capacity*	-10k	3-13k	4-20k	7-30k	7-30k	18-60+k	18-60+k
Scheduled Speed	10-20km/h	15-25m/h	20-30 km/h	20-40km/h	20-40km/h	30-40km/h	30-40km/h
Land Acquisition	no acquisition	along roads	only stations	only stations	station & some roads	station & curve sections	station exit only
Stop Spacing	0.3 – 1 km	0.5 – 1 km	0.5 – 1 km	0.5 – 1 km	0.3 – 1 km	1 – 2 km	1 – 2 km
Initial Cost	USD ~1 M/km	USD 2 M/km	USD 30-60 M/km	USD 30-60 M/km	USD 35-60 M/km	USD 45-70 M/km	USD 90-100+ M/km
O&M Cost	N/A	USD 1.3 / car-km $0.03 per pax.	USD 2.0 / car-km $0.04 per pax.	USD 2.5 / car-km $0.03 per pax.	USD 4.0 / car-km $0.04 per pax.	USD 5.0 / car-km $0.03 per pax.	USD 5.0 / car-km $0.03 per pax.
Daylight Interference	Not at all	Not at all	Pier & Slab	Pier & Beam	Pier & Slab	Pier & Slab	Not at all
Aesthetic Concern	No Concern	Station only	Pier & Slab	Pier & Beam	Pier & Slab	Pier & Slab	Not at all
Noise	Rubber Tyre & Engine	Rubber Tyre & Engine	Rubber Tyre	Rubber Tyre	Steel Rail & Tyre	Steel Rail & Tyre	No noise to ground level

Note: 'M' stands for million. 'N/A' stands for not available. Bus includes conventional bus and bus priority lane. Due to limited information availability on transit in African countries, cost information is based on Asian context.

Source: Urban Transport System Development Project for Colombo Metropolitan Region and Suburbs (2014), edited by the Study Team

In addition to development of the transit system, travel/TMD (Transport Demand Management) is an option to be considered for shifting surging travel demand by private modes of transport to public modes with relatively limited investment. The TDM is a relatively new management policy on the demand side, typically managing choice behaviour by providing incentive and disincentives in terms of frequency, destination, mode of travel, route, time of a day and vehicle occupancy as shown in Figure 7.3.15. It also should be mentioned that some pricing options such as electronic road pricing and parking charges generate additional revenues.
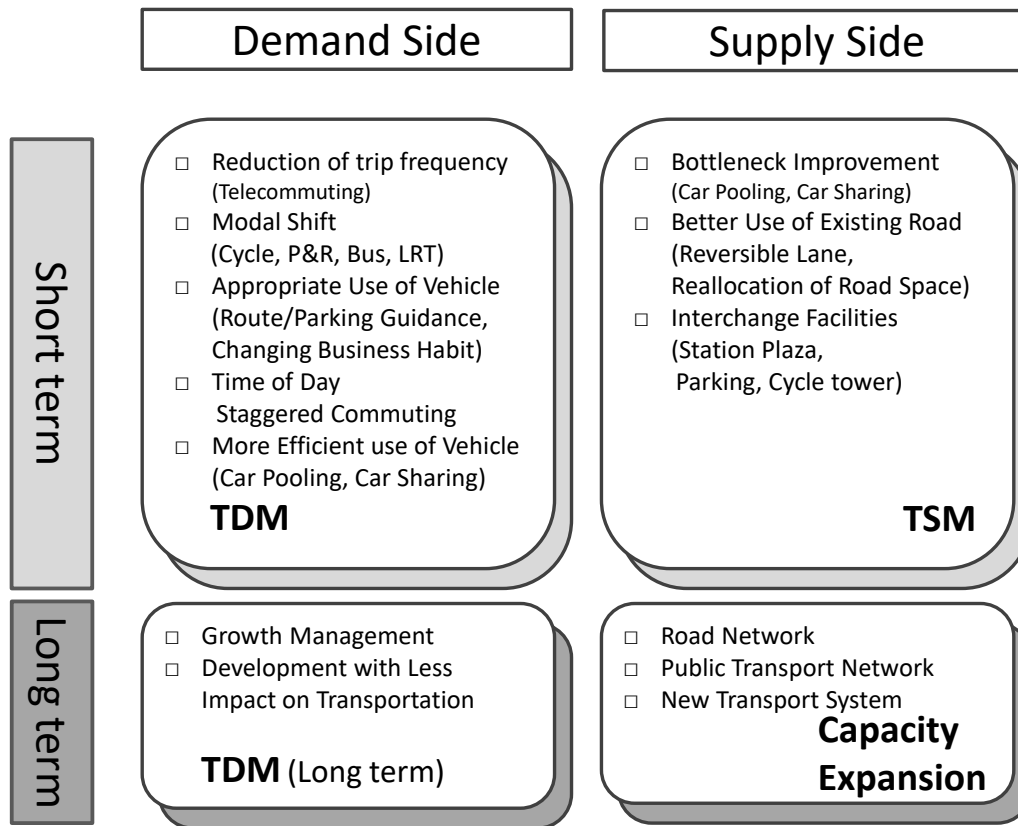
Figure 7.3.15   Demand-side and Supply-side Transport Planning Measures

In the context of the Study Area, fees or taxes on parking in the CBD in conjunction with parking management system development and strict low enforcement discussed in Section 7.3.7 are feasible measures of the TDM. Since a car trip in the busy CBD contributes traffic congestion and requires space for parking, it should be justified. It also should be noted that car users can generally afford to pay fees as they can purchase a car.

Fees charged on lubricants (CDF of USD 0.25 equivalent per litre) and fuels (CDF of USD 0.10 equivalent per litre) on land as mentioned in Section 7.1.8 can be increased taking the expected significant increase of the number of cars and motorcycles as well as their economic externalities such as traffic congestion, emission of air pollutant and traffic accidents.

Vehicle inspection is a procedure to inspect conformity to the technical standard of a vehicle in terms of safety and/or emissions. Due to technical, institutional and financial reasons, the vehicle inspection is not functioning for vehicles of both private and public use in the Study Area. However, it can be a chance to collect fees and charge penalties to sub-standard vehicles. By increasing fees and penalties, that revenue can be utilized for transportation infrastructure development. The strict implementation of vehicle inspection with international standard is, of course, essential.

Worktime flex-time and shift scheduling are policies to change departure time avoiding morning and evening peak hours, typically implemented to employees of the government office workers and collaborating private companies. The policy can be applied to all employees in an office or factory. While cooperation from private sectors is a prerequisite, it can be implemented with limited financial resources.

Mobility management, a policy to enhance individuals and organizations to change their travel behaviours to be suitable for both of them typically through communication measures, is widely applied to reduce the usage of private modes of transport. A typical example is the "Travel Feedback Programme" which provides information on respondents' previous travel behaviour such as CO_2 emission and calorie consumption to enhance modal shift to public transport. As the mobility management usually does not require infrastructure improvement, it can be implemented with limited budget.

7.3.3 Network Development of Trunk Roads and Transits

The overall concept and policy on road and public transport network development are discussed below while the detailed network plan is examined in the Section 7.5 and 7.8 by comparing several network alternatives based on the travel demand analysis in Section 7.6.

(1) Road Network Development

a) Proposed Road Network Hierarchy

A proper road network contributes to an efficient development of the region. A systematic and hierarchical road network is imperative to form a proper road network in the entire region. Besides, inter-regional connections should be considered comprehensively to achieve the development and enrichment of the region.

At the same time, the functional classification or the grouping of highways by the type of services they provide was proposed for transport planning purpose. The functional classification for a comprehensive transport planning is an important planning tool.

However, the actual road classification in Kinshasa City is based on a road conditions system rather than a functional classification.

A redefinition of the road hierarchy according to functional classification was set for the Study before proceeding to the future road network planning.

1) Introduction

The functional classification of a highway or street is primarily based on motor vehicle travel characteristics and the degree of access provided to adjacent properties. The Figure 7.3.16 shows the six recognizable travel hierarchies in a single trip, i.e. (i) Main (through) movement, (ii) Transition, (iii) Distribution, (iv) Collection, (v) Access, and (vi) Termination.

Functional classification is applied to grouping streets and highways according to the characteristics of services they intend to provide. This classification recognizes that individual roads and streets do not serve for the travel independently. Rather, the travel involves hierarchical movements throughout the road network and each link of the road network can be classified by its

relationship to the hierarchical movement. Thus, functional classification of roads and streets is consistent with hierarchy of the travel (movement).
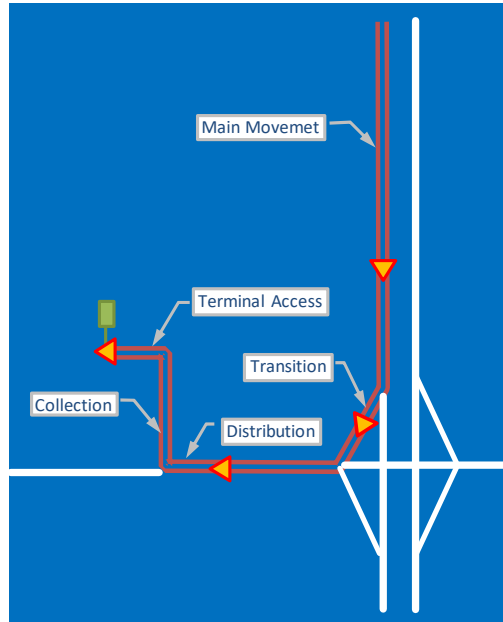
Source: A Policy on Geometric Design of Highways and Streets, AASHTO

**Figure 7.3.16   Hierarchy of Movement**
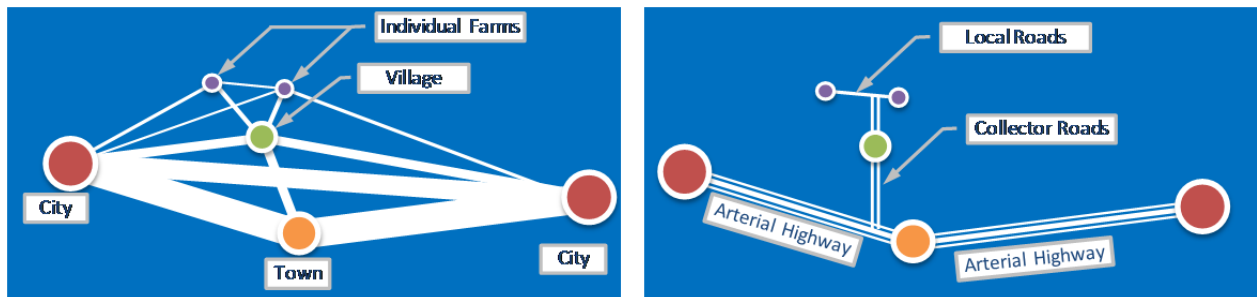
(A) Desire Lines of Travel   **(B) Road Network Provided**

Source: A Policy on Geometric Design of Highways and Streets, AASHTO

Figure 7.3.17   Channelization of Trips

Figure 7.3.17 shows that the channelization of trips that leads logically not only to show a functional hierarchy of road classes but also a similar hierarchy of relative travel distances served by these road classes. The hierarchy of travel distances can be related logically to functional specialization in meeting the property access and travel mobility needs. Local facilities emphasize the land access function. Arterial roads for main (through) traffic movement or distribution emphasize the high level of mobility. Collector roads offer approximately balanced services for both mobility and access functions. This functional balance between different road classes is illustrated conceptually in Figure 7.3.18.
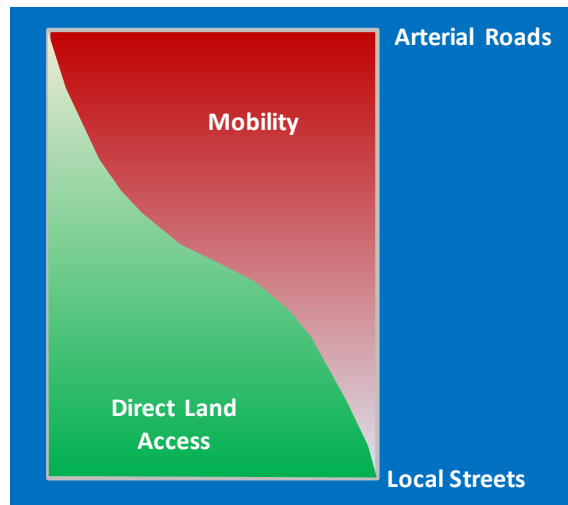
Source: A Policy on Geometric Design of Highways and Streets, AASHTO

Figure 7.3.18   Relationship of Functionally Classified System in Serving Traffic Mobility and Land Access

2) Definitions of Functionally Classified Road Systems

The functional road hierarchy system and the definitions of functionally classified road systems are proposed as shown in Table 7.3.3. Also, when these characters and features are brought together, they relatively and logically fall in place together.

Table 7.3.3   Definitions and Conceptual Matrix of Functionally Classified Systems

Urban Systems	Definitions	Network Characteristics	Traffic Characteristics		
		Connectivity	Trip Length	Traffic Volume	Travel Speed
Primary Road System	- carries most of the trips entering and leaving the urban area, as well as most of the through movements bypassing the central city. - serves significant inter-urban travel.	Inter-urban	Long	High	High
Secondary Road System	- interconnects with and augments the primary road system. - distributes travel to geographic areas smaller than those identified with the higher system.				
Tertiary Road System	- provides both land access service and traffic circulation within residential neighbourhoods and commercial and industrial areas. - collects from local streets in residential neighbourhoods and channels into the primary or secondary road systems.				
Local Road System	- comprises all facilities not in one of the higher systems, - primarily permits direct access to abutting lands and connections to the higher order systems.	Inner community	Short	Low	Low

Source: The Study Team

The target spacing of each road systems are shown in the Table 7.3.4.

Table 7.3.4   Target Spacing of Functionally Classified Systems

Urban Systems	Areas	Spacing	
		Minimum	Maximum
Primary Road System		1.6 km (highly developed CBD)	8 km (urban fringe)
Secondary Road System	CBD	0.2 km	1.0 km
	suburban fringe	3 km	5 km
Other Road Systems		Less than the above	Less than the above

Source: AASHTO, edited by the Study Team

To develop the future road network plan, the applied hierarchical classification is *Primary and Secondary roads* in this Master Plan Study.

b) Proposed Road Design Standard

One of the principles of a road infrastructure development is to develop a road network that

exhibits a configuration based on functional classification comprising of primary roads down to other roads. Considering that roads play multiple roles such as traffic service, inducement of development and so on, it is important to classify roads according to their hierarchical function. This method will develop a more effective and well-coordinated road geometry and structure.

1) Geometric Design Standard in DRC

There is an only one road design standard in DRC which is published by OR. Most of them are descriptions concerning construction materials, geotechnical characteristics, pavement structures, etc., and descriptions on road geometric design are very limited. Also, it seems that the standard was prepared for the roads of rural areas, not the urban roads because there is no mention of pavements.

Table 7.3.5 shows main geometric design elements of OR Standard in the flat terrain. The road types are only three; namely, National roads, Secondary roads and Agricultural Service roads. The terrain is divided into three of flat, hilly and mountainous.

Table 7.3.5　Geometric Design Standard of OR in Flat Terrain

Terrain Items Road Types	Design Speed Range	Flat			
		Width			
		ROW	Shoulder	Roadway	Pavement
	(Km/h)	(m)	(m)	(m)	(m)
National Roads [RN]	80 - 110	100	3	16	8
Secondary Roads [RS]	60 - 80	50	2	10	7
Agricultural Services [RD]	50 - 60	30	1	7	6

Source: OR

2) Functional Classification as a Design Type

The relationship between functional classification and design speed is logically presented in "Hierarchy Settings". The design type adds an expressway. The expressway is not a functional classification in itself but is normally classified as the primary road system. It, however, has a unique geometric standard that demands a separate design specification apart from other primary roads. Thus, the familiar term "expressway" is used in the basic functional classification, which is preferable than adopting a completely separate system of design types.

3) Proposed Geometric Design Standard for Master Plan

The geometric design for the Master Plan is proposed as shown in Table 7.3.6, based on AASHTO (American Association of State Highway and Transportation Officials) and Japanese Road Design standards in reference with DRC standards. Also, the configurations of these typical cross sections are illustrated as shown in Figure 7.3.19 through Figure 7.3.21.

Table 7.3.6   Proposed Geometric Design Standard for Master Plan

Urban Systems	Design Speed	No. of lanes	Cross Sectional Elements					
			Carriageway	Median	Shoulder	Sidewalk	Roadway	Right-of-Way
	(km/h)	–	(m)	(m)	(m)	(m)	(m)	(m)
Urban Expressways	100	4	3.50	3.0	3.0		23.0	40
		6	3.50	7.0	3.5		35.0	50
Primary Road Systems	80	8	3.50	4.5	2.5	5.0	47.5	50
		6	3.50	4.5	2.5	4.0	38.5	40
		4	3.50	4.5	2.5	4.0	31.5	35
Secondary Road Systems	60	4	3.25	3.0	3.5	3.0	29.0	30
		2	3.25	3.0	3.5	3.0	22.5	25

Source: The Study Team
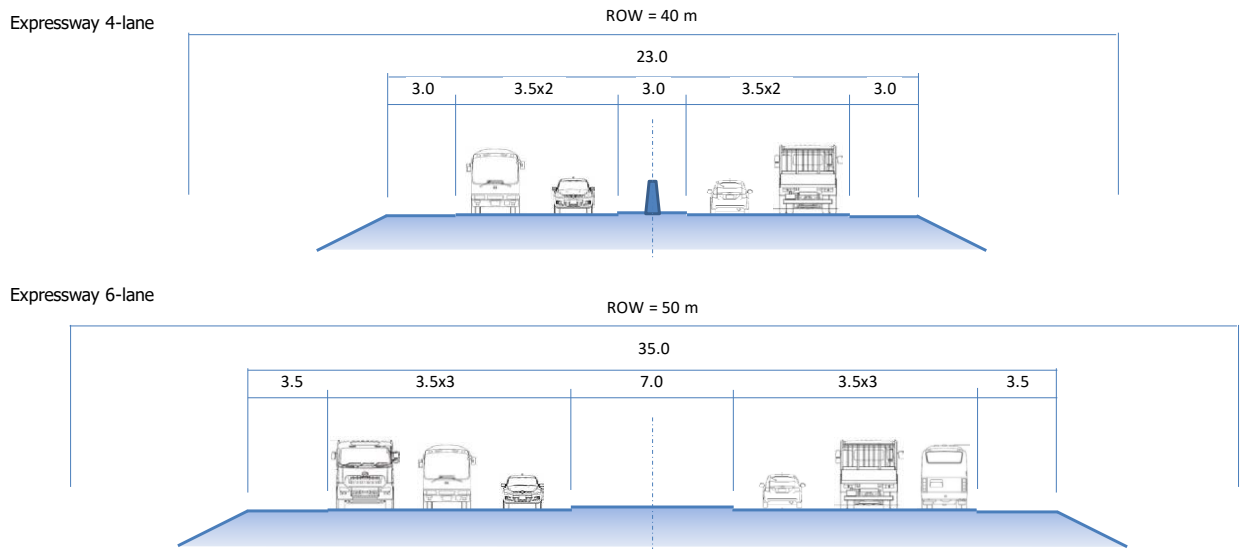
Source: The Study Team

Figure 7.3.19   Proposed Typical Cross Sections of Expressway for Master Plan (At-grade)

Primary 8-lane
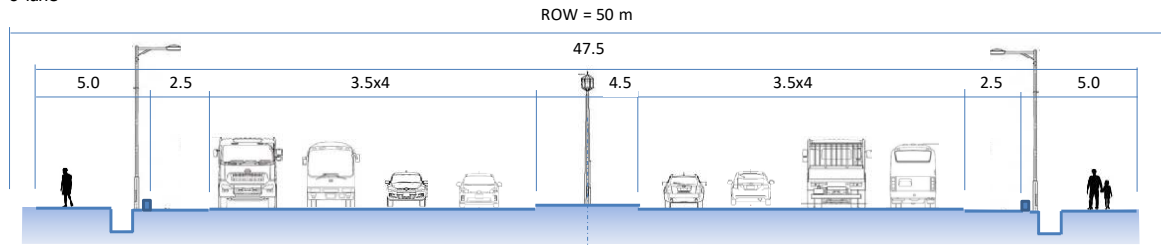
Primary 6-lane
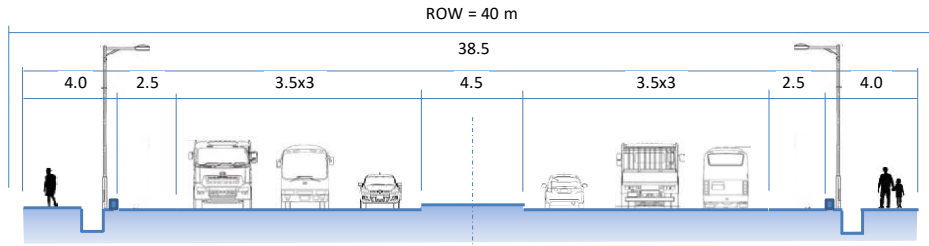
Primary 4-lane
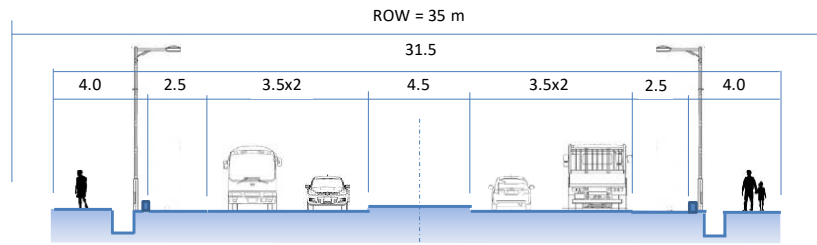
Source: The Study Team

Figure 7.3.20   Proposed Typical Cross Sections of Primary Roads for Master Plan

Secondary 4-lane
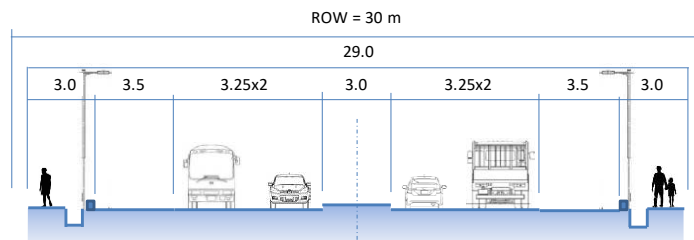
Secondary 2-lane
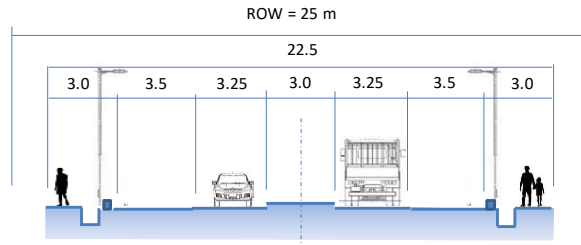
Source: The Study Team

Figure 7.3.21   Proposed Typical Cross Sections of Secondary Roads for Master Plan

c)   Future Network Development of Trunk Roads

1)   Strategic Roads in Study Area

The strategic roads are defined to mainly serve for heavy and long distance logistics transport. They should be designed as high-mobility roads divided by median. Strategic roads should accommodate the following functions:

- To connect with logistic terminals such as seaports, airports and other freight terminals, development clusters including industrial zones and business centres, and regional and international gateways,

- To connect with CBD and high population density areas including the city centre and sub-centres,

- To form a backbone network connecting with international and regional trunk roads of the east-west and north-south roads, and

- To functionally connect three urban divisions each other.

The strategic road network is mainly comprised of two categories of road based on their characteristics and functions; namely, the one is ring roads which have a bypass function and the other is east-west/north-south roads which have an axis function including regional radial roads and international links.

The Figure 7.3.22 shows the proposed strategic road network in the Study Area.
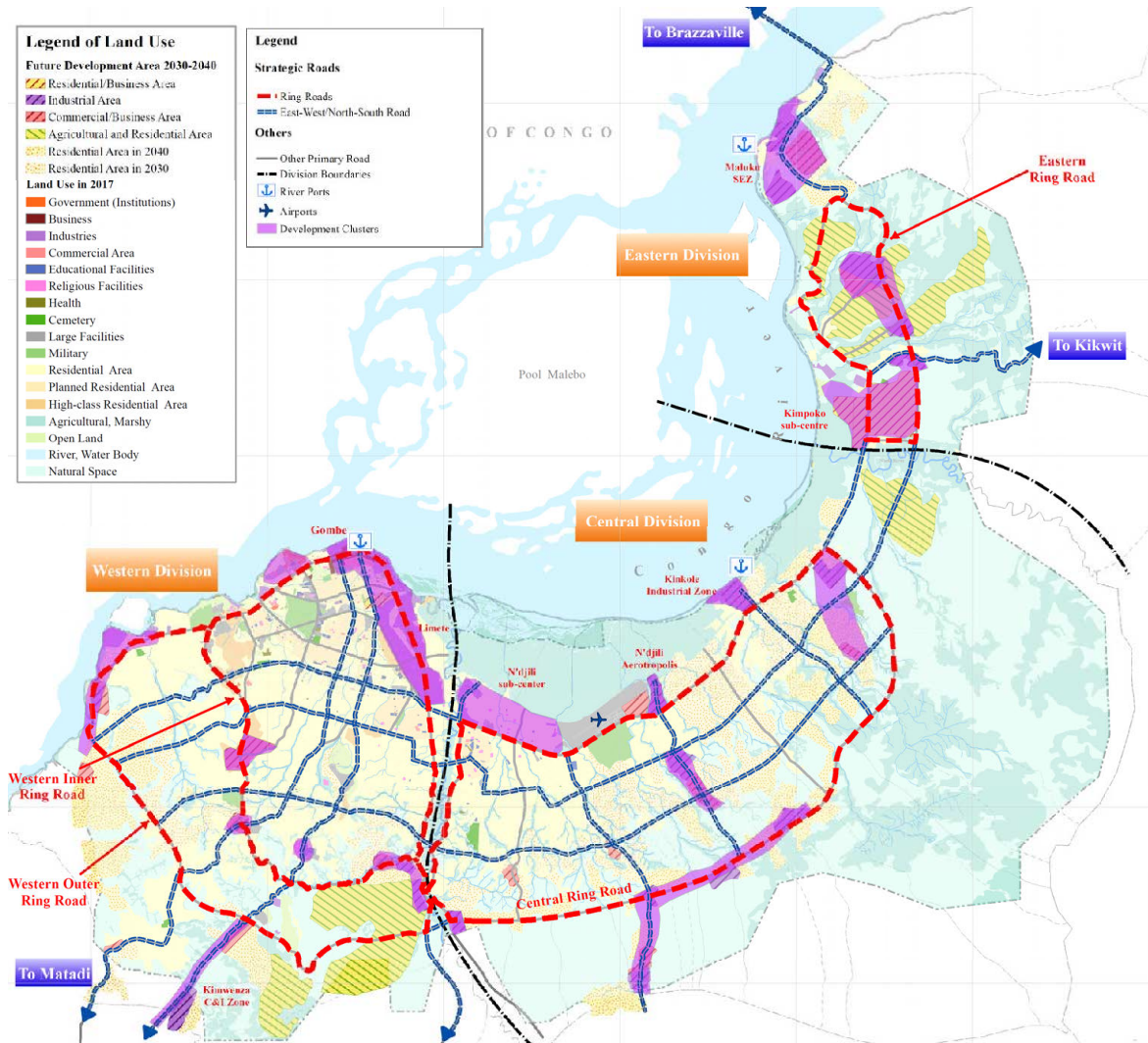
Source: The Study Team

Figure 7.3.22   Proposed Strategic Road Network in the Study Area
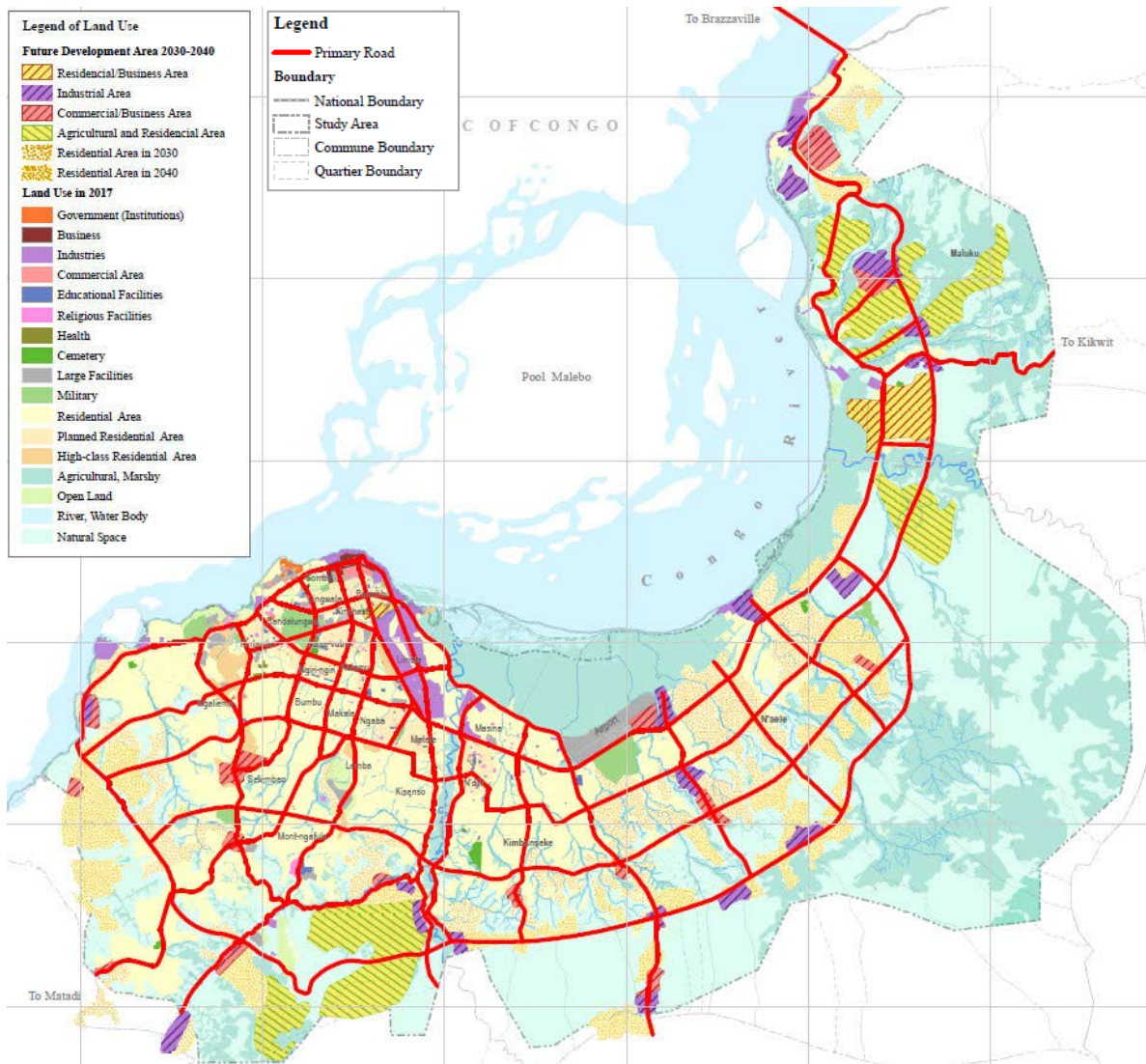
2) Primary Roads in the Study Area

The primary road network system covers the entire strategic road network and it should be formed to fulfil the following functions:

-   To connect with the strategic road network and all the major urban centres including commune centres,

-   To accommodate the facility to serve for a heavy-loaded, high traffic volume and relatively long distance travel,

-   To assure the high mobility for a large-sized and long distance vehicular traffic,

-   To form a grid pattern to secure the target spacing designed for the functionally classified

system shown in Table 7.3.2, and

- To consider the road network of SOSAK that has been approved by the Provincial Council.

Figure 7.3.23 shows the proposed primary road network including the strategic road network in the Study Area.

Source: The Study Team

Figure 7.3.23   Proposed Primary Road Network in the Study Area

3) Secondary Roads in the Study Area

The secondary road network is planned to interconnect with and augment the primary system. Also, it distributes travel to geographic areas smaller than those identified with the higher system. It should serve for the following functions:

- To connect between primary roads and all the urban centres including quartier centres,

- To interconnect quartiers in communes,

- To form a grid pattern, considering the target spacing of functionally classified systems shown in the Table 7.3.4, and

- To consider the road network of SOSAK that has been approved by the Provincial Council.

Figure 7.3.24 and Figure 7.3.25 show the proposed road network in 2030 and 2040 respectively including secondary road network in the Study Area.
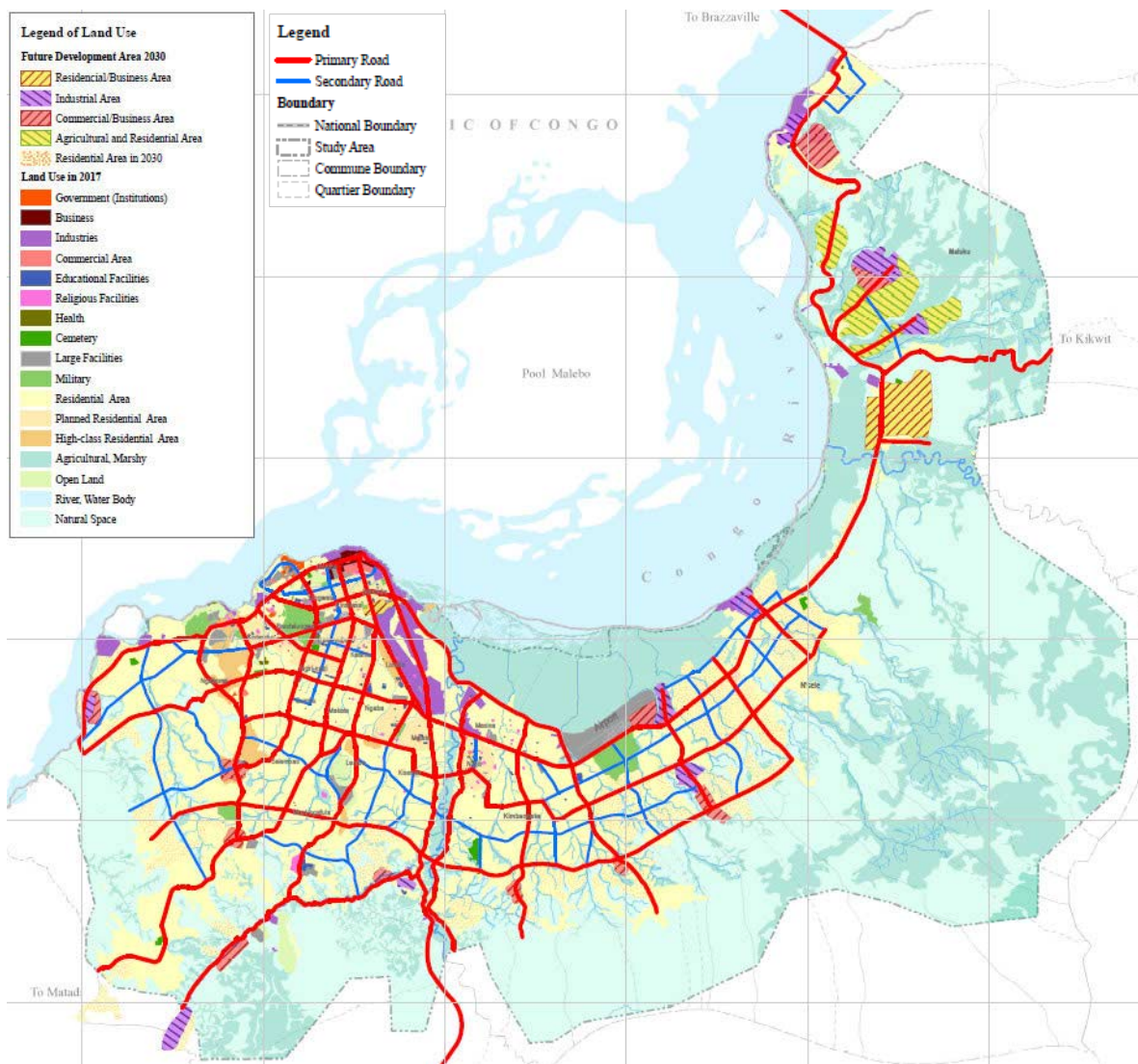
Source: The Study Team

Figure 7.3.24   Proposed Road Network 2030 in the Study Area
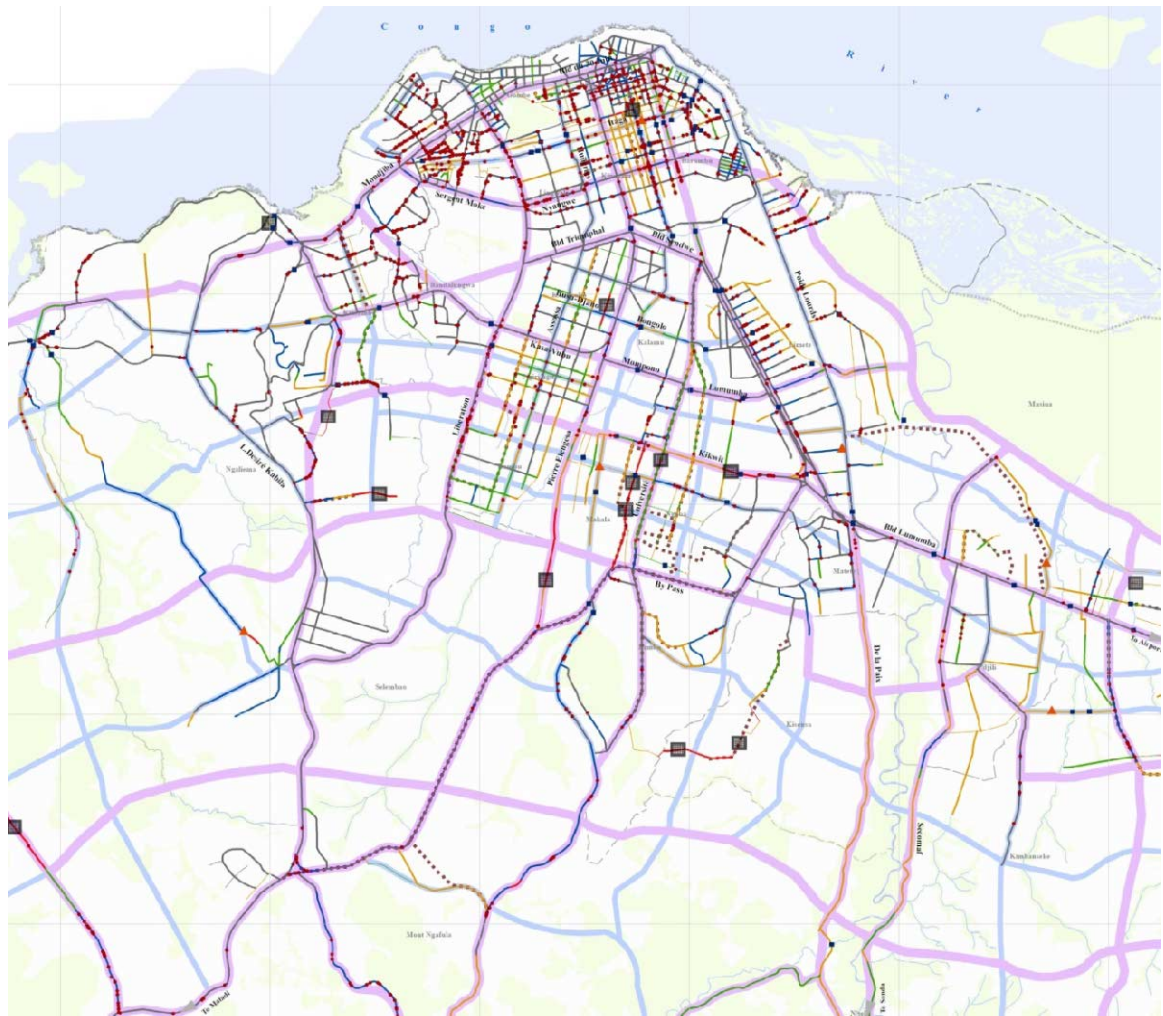
Source: The Study Team

Figure 7.3.25   Proposed Road Network 2040 in the Study Area

The current road network is shown in Figure 7.3.26, and, the comparison with the current road network and the proposed road network of the current urbanized areas are shown in Figure 7.3.27. It should be noted that significant road network development including improvement of existing roads and construction of new roads are required in addition to the committed road projects described in Section 7.4.1.
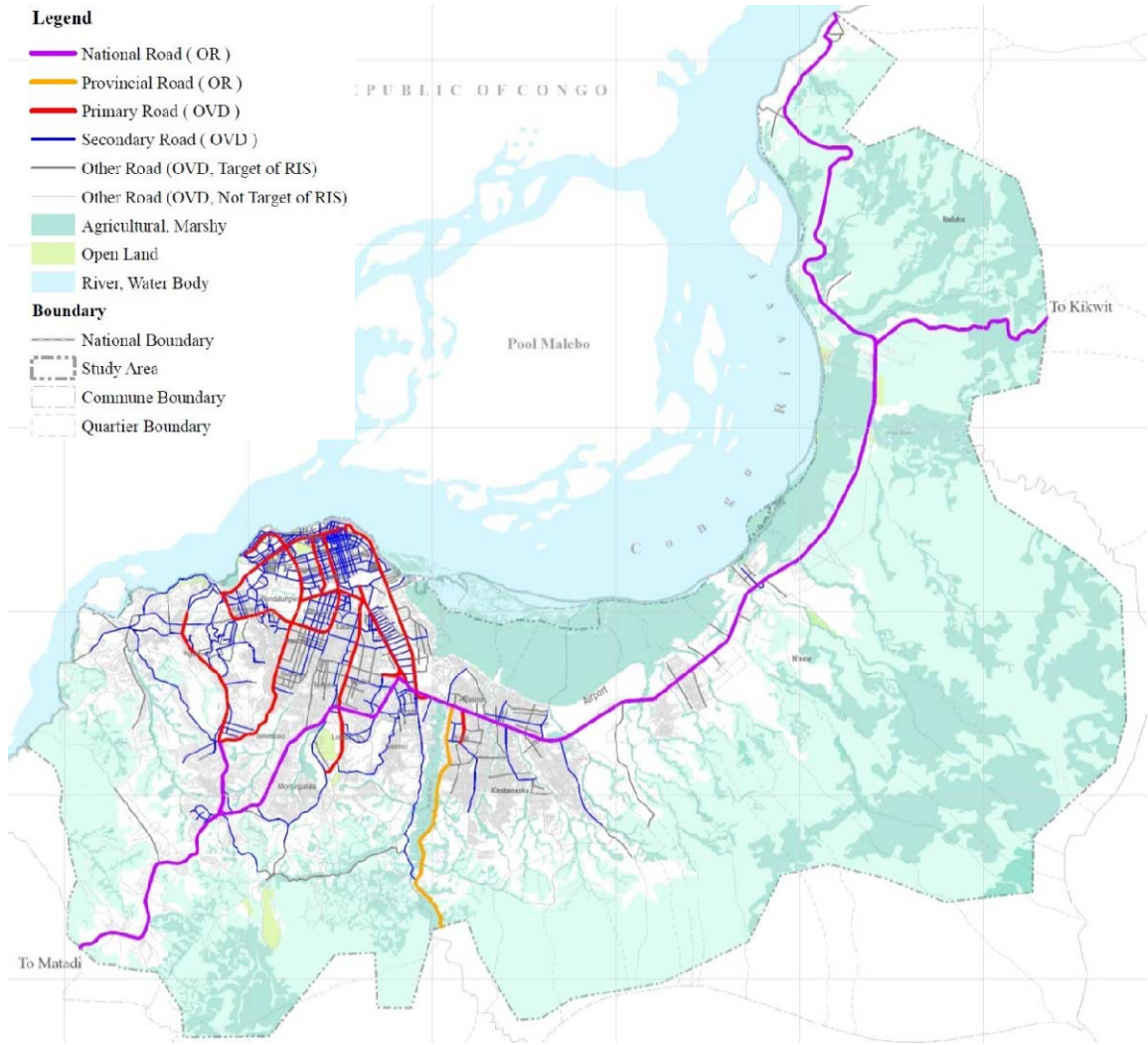
Source: The Study Team

Figure 7.3.26   Current Road Network in the Study Area

Legend

Pot Holes and Other Obstacles (RIS)

• Pot Holes (Excluding continuous pot holes)

■ Bridges, Box Culverts

▲ Other Obstacles (Pipeline, Fence, etc)

▨ Impassable

Surface Condition (RIS)

10m or more		Less than 10m	
—	Good/Fair	—	Good/Fair
—	Poor	—	Poor
—	Bad	—	Bad
—	Very Bad	—	Very Bad
—	Impassable	—	Impassable

Comitted Road

▪▪▪ Comitted Road (4-Lane)

▪▪▪ Comitted Road (2-Lane)

Future Road Network in 2040

— Primary Road

— Secondary Road

Other

▨ Congo River

▨ Green Space

∿ River

▨ Study Area

▢ Commune Boundary

Source: The Study Team

Figure 7.3.27   Current Road Condition and the Proposed Road Network 2040

4)   Expressways in the Study Area

The estimated population in the Study Area will be expanded up to 23 million persons in 2040, and it is more than twice of the population in 2017.

In urban areas with a huge population, an expressway network is generally planned to densify the urban road network in the urbanized area. The urban expressway network is proposed to deal with the future rapid growth of vehicular traffic accruing from the rise of income in the population.

Expressways are part of primary roads with full access control. They intend to provide for high levels of safety and efficiency in the movement of large volumes of traffic at high speeds. Control of access refers to the regulation of public access rights to and from properties abutting the highway. Urban expressways are classified as depressed, elevated, ground-level, or combination-type. These expressway types are used as in appropriate for conditions. Expressways should serve the following functions:

- To connect between high demand areas such as major logistic terminals, major development clusters and major business centres including city and division centres, and

- To connect rural expressways out of the Study Area.

Figure 7.3.28 shows the outline location of the urban expressway network in the Study Area.
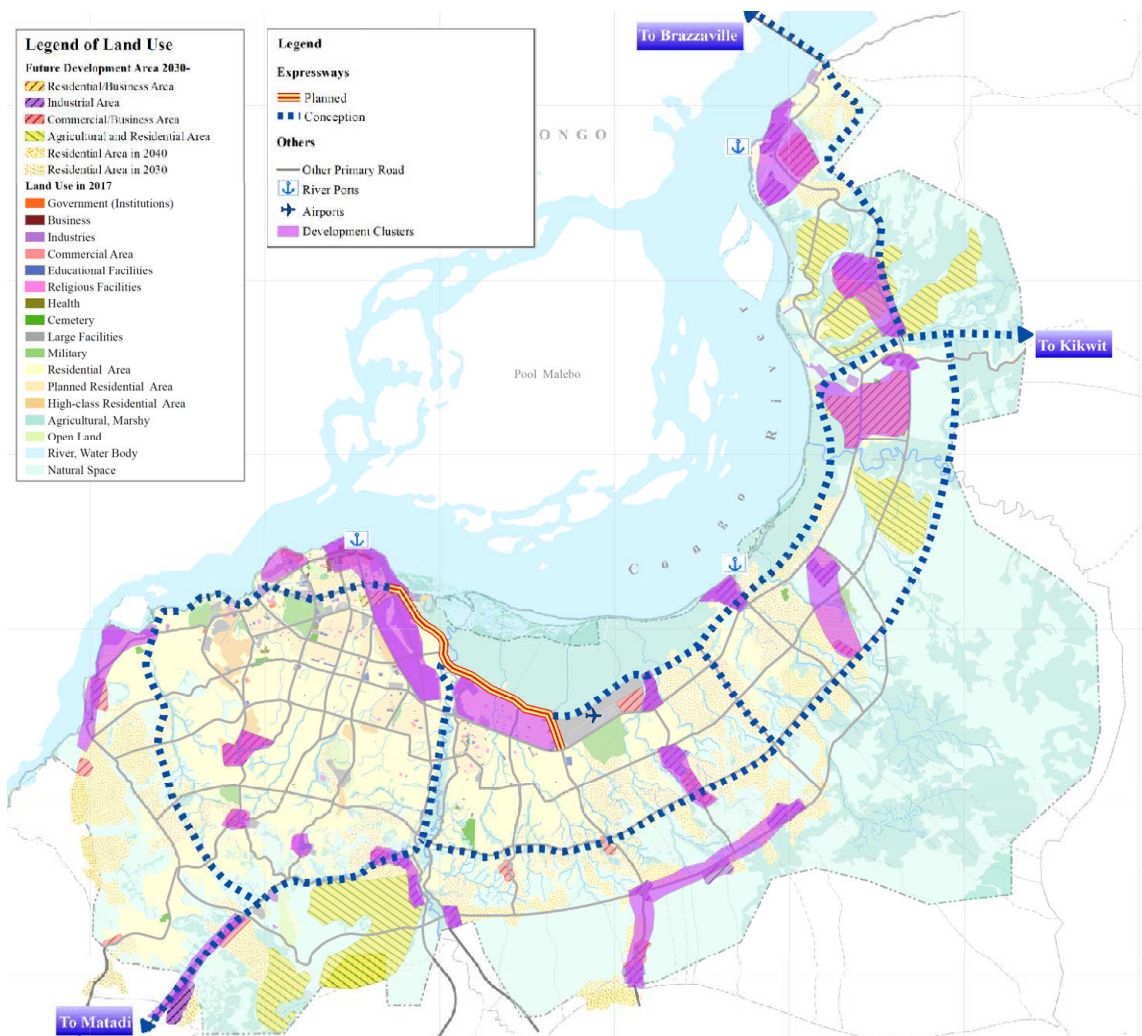
Source: The Study Team

Figure 7.3.28   Urban Expressway Network in Study Area after 2040

(2) Public Transport Network Development

For the purpose of formulating the public transport network plan, seven aspects have been considered. The proposed public transport network and the current public transport network are illustrated in Figure 7.3.29 and Figure 7.3.30 respectively.

a) Conformity with Existing Plans and Projects

The SOSAK public transport network plan described in Section 4.3.2 is the reference for the public transport network formulation. Since the SOSAK is the plan approved by the provincial council, the public transport network of the PDTK also should maintain consistency with it, although it can be updated based on changes of socio-economic conditions after the study of the SOSAK. In terms of public transport, the SOSAK proposed the railway renovation and development of "*Axe Lourd de Transport*" (or translated, "heavy axis of transport") which is, in principle, a BRT system, although it can be converted into LRT. Therefore, the transit corridors of the PDTK should be in line with "*Axe Lourd de Transport*" while there might be minor revisions on it.

On the other hand, the feasibility study on the Kinshasa-Ilebo Railway Project including the Kinshasa-Brazzaville bridge at Maluku has been conducted in 2016. It is expected that the project will be completed by the year of 2022. As this is a national-level project, and the project component is included in the PDTK public transport network. The detail the project is described in Section 7.4.2.

b) Consistency with the Land Use Plan

The public transport network of the PDTK should be consistent with the land use plan proposed in Section 6.4.2. The proposed business and commercial centre in the Study Area should be covered by urban transit corridors which are served by the high capacity public transport systems such as a BRT, a LRT and an urban railway. Other urbanized areas should also be served by the feeder services to urban transit corridors. Figure 7.3.29 depicts relations with future land use and conceptual transit network in 2040.

c) Travel Demand

For the financially sustainable operation of transit system such as a BRT, an LRT and an urban railway, significant travel demand is essential as it requires a relatively expensive system compared with a road. The desired line of future travel demand in 2040 shown in Figure 7.6.4 is utilized for drafting the public transport network. The urban transit corridor is planned to serve origin-destination pairs with a higher number of trips. The details on the travel demand analysis is discussed in the Section 7.6, and, the consideration of transit modes is discussed in the alternative scenario analysis in Sections 7.5 and 7.8.

d) Potential Open Space for Installation

For the implementation of the transit system, space for installing the system is one of critical points in many cities in the world as land is scarce and expensive in the urbanized area. Additionally, the administrative procedure for involuntary relocation is often a critical path of project implementation. It sometimes cancels the project itself after political interventions. Therefore, minimizing land acquisition and involuntary relocation by utilizing road spaces and the

existing railway is the key for smooth implementation of public transport project.

e)   Connectivity as an Integrated Public Transport Network

Smooth connectivity of each public transport mode is essential for improving the overall service level of the public transport system and enhancing a modal shift to public transport. Many trips by public transport modes require transfers to reach their final destination, as it is not possible to construct public transport routes to cover all origin-destination pairs. While connecting all origin and destination pairs in the network with minimum transfers is preferable, it is not financially feasible. Thus, routes are categorized into a trunk route, which corresponds to an international railway network and urban transit corridors, and a feeder route, which corresponds to the feeder services, are shown in Figure 7.3.29.

f)   Accessibility to Urban Functions

Since private modes of transport are not available for all residents in the Study Area, public transport is sometimes the only option of making trips in some areas except for long distance walking. Thus, the public transport network needs to cover major urbanized areas in the Study Area. Residents in the CBD and surrounding can access to the transit and feeder services network within 1km as the network is planned for every 2km or less.

g)   Technical Considerations

Other technical aspects are also taken into account. There are railway services which pass through the Study Area such as the cargo train from Ilebo to Matadi. These services should minimize the impact on urban passenger service as the freight service is usually slow. To minimize the travel distance within the Study Area, triangular junction is planned at the branch of the railway line to Matadi and the railway line to the airport. It is also planned at the junction of railway line to Kinshasa – Brazzaville bridge and railway line to Ilebo.

For the railway service, all the lines are planned to be able to share the depot and to be connected with the workshop which requires a huge open space. The connection of two railway lines also allows direct service using two or more railway lines.
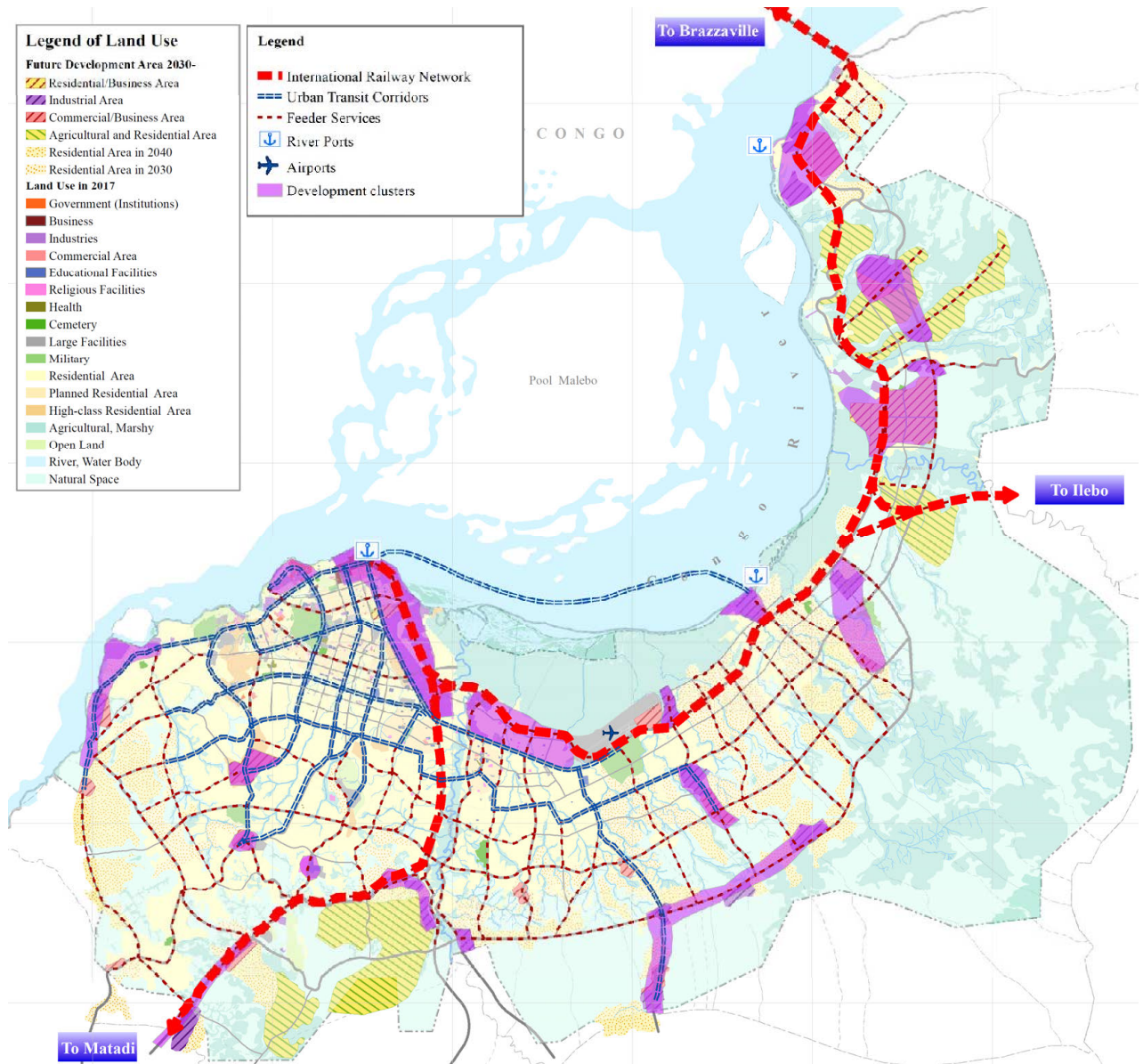
Source: The Study Team

Figure 7.3.29   Concept of Public Transport Network
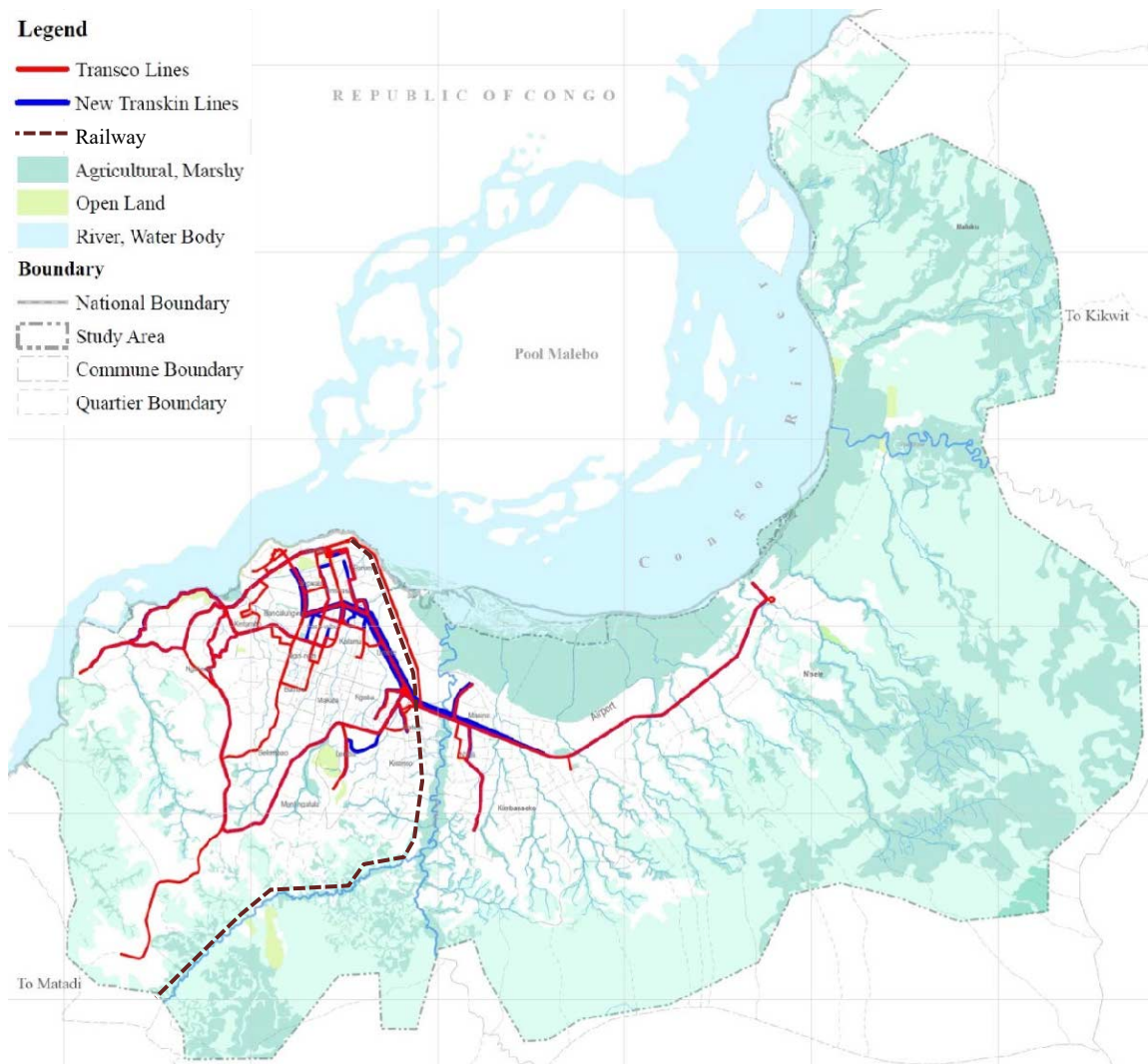
Source: The Study Team

Figure 7.3.30   Current Public Transport Network in the Study Area

7.3.4   Establishing Road Maintenance and Operations Programmes

(1) Policies for Road Maintenance and Operations

The road administrator must repair and maintain roads in good condition at all times so that they do not interfere with general traffic.

- To that end, road management policies should prioritize the following:

- Maintenance of Facilities: Always maintain roads in good condition

- Maintenance of Function: Complete repairs before damage becomes critical

- Maintenance of Environment: Implement countermeasures against noise and vibration, such as caused by differences in roadway levels

a) Efficient Road Maintenance Management to Achieve Optimal Effect at Minimum Cost

From the life cycle cost perspective, it is important to select the appropriate maintenance and repair methods at the appropriate time, and to provide the most valuable service for the cost.

The effective management of roads means maintaining good road conditions and functionality. Doing so within a limited budget requires systematic, early identification of problems and prompt repairs.

Figure 7.3.31 below shows that repairing roads after damage has progressed beyond the serviceability limit requires extensive road renovation and leads to significantly higher costs.
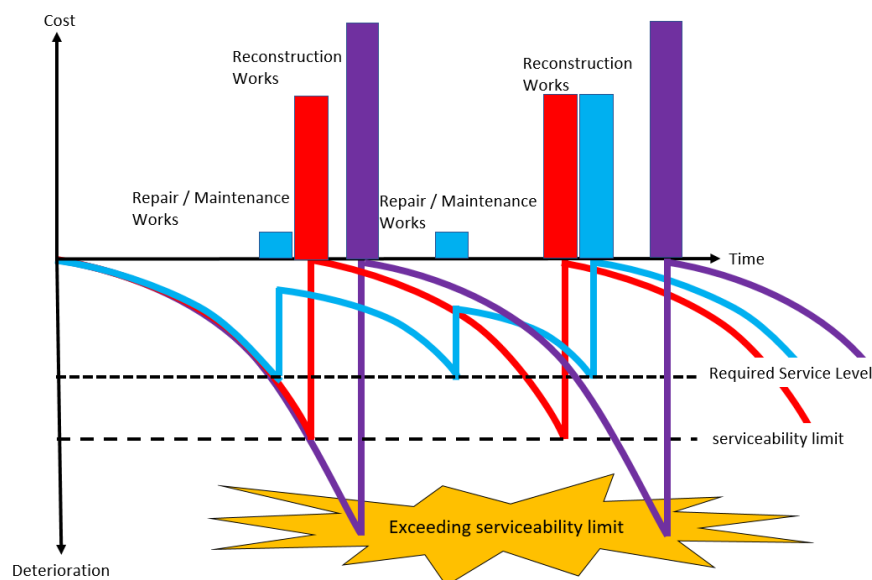
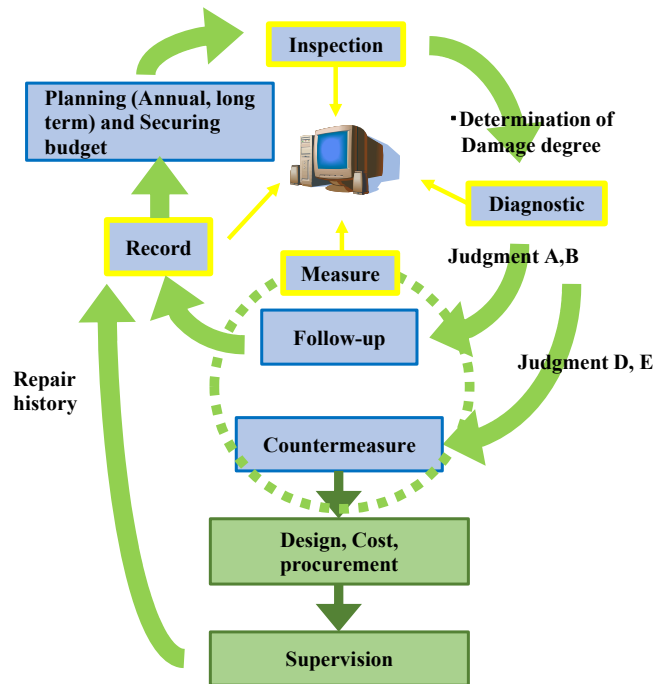Source: Project for Capacity Development of Road Maintenance Management

Figure 7.3.31   Comparison of Life Cycle Cost

b) Realization of the PDCA cycle

The maintenance and management of roads requires carrying out the PDCA cycle (Plan, Do, Check, Adjust).

The outline of the overall procedure is as follows: a) setting management objectives, b) understanding current road conditions, c) evaluating the soundness of future forecasts, d) accumulating and updating data, e) formulating maintenance and repair plans, f) implementing maintenance and repair, g) post-implementation evaluation / feedback of results.

Based on the above procedure, the proposed PDCA cycle for the road maintenance and repair is shown in Figure 7.3.32.

Source: Project for Capacity Development of Road Maintenance Management (JICA)

Figure 7.3.32   Proposed PDCA Cycle

In the PDCA cycle, the road maintenance plan for each year is formulated (P), maintenance and repair is implemented (D), the results summarized (C, D), and the cycle is repeated and data accumulated. Future predictions for road maintenance are made possible by accumulating data.

The Maintenance Management in Kinshasa province has just started the PDCA cycle through PRCMR (the Project for Capacity Development of Road Maintenance Management) that is supported by JICA. It is necessary to have a high consciousness that the roads shall be kept in good condition at all times and to prevent disrupting general traffic through continuous vigilance.

(2) Policies for Drainage Management

a)   Basic data acquisition to facilitate the understanding on the actual situation

Various detailed studies were conducted to evaluate the capacity of the drainage system and the risk of erosion in Kinshasa City.

For example, BEAU has conducted a pre-investment study on the sanitation network including the evaluation of the drainage system, named "Kinshasa: Assainissment Anciennes Cites", in 1987; and a study on erosion risk, named "Kinshasa: lutte anti-erosive" in 1988. Such fundamental studies have to be reviewed by using the latest data, in order to understand the actual situation, capacities and issues of existing facilities. On the other hand, CRGM (*the Centre de Recherches Geologique et de Mines*/ Centre for Geological and Mining Researches) is conducting research on the situation of groundwater and geo-disasters in collaboration with the University of Kinshasa. RVF has analysed the latest meteorological trends and is coordinating with OVD to conduct hydrological studies. A database aiming to stock hydro-meteorological data and studies is planned

to be installed under the PANAV project of WB.

However, the areas targeted by the studies and researches described above are not so wide due to the budgetary constraints. Consequently, the basic data, such as the situation of the drainage system (width, depth, length and condition of each channel), land-use and coverage, geology and topography, are limited or need to be updated, in order to understand the actual risk exposure of Kinshasa City.

b)   Common rules (standards) to re-dimensioned drainage channels

As mentioned above, the volume of water flowing into channels is tending to increase due to the changes in land coverage, and the failure of the drainage system to discharge causes overflow. On the other hand, since the standards or methodology used to design gutters differ from road to road, some contradiction between upstream and downstream discharge capacities occurs. To re-dimension the channels and maintain the continuity of the system, a common standard on the setting of calculation conditions and design (rainfall intensity formula, inclination, runoff coefficient, dimension and other issues to consider such as environmental considerations) needs to be formulated and shared.

(3) Policies for Constitution of Road Maintenance Management

1)   Technical Issues

a)   Utilization and Distribution of Asphalt Pavement Road Maintenance Technical Guidelines

After establishing the asphalt pavement road maintenance technical guidelines, which are currently prepared by the PRCMR Working Group, the administrator in charge of road maintenance management shall incorporate and distribute the guidelines, and shall strive to improve the skills of engineers engaged in road maintenance and repair work.

b)   Early Repair Work

In order to reduce life cycle costs, it is important to promptly repair the surface layer when damaged, and to preserve the layers below the surface in good condition at all times.

2)   Budget

The main source of budget for road maintenance and repairs is limited by the fund from FONER.

In order to efficiently maintain and manage the road under a limited budget, it is conceivable to allocate budget by the prioritization of repair sections based on the database made from the road inspection results.

3)   Institutions

It is known that road damage progresses more rapidly as traffic volume increases. Additionally, heavy vehicles cause significant damage to asphalt roads and so it is critical to strengthen institutional measures to prevent those vehicles from travelling on asphalt roads not designed to accommodate them.

4) Human Resource Development

Utilizing the results of training by the PRCMR counterpart, the PRCMR counterpart will conduct training to OR and OVD technicians involved in the road maintenance with the aim of sharing/ transferring knowledge and experience.

7.3.5 Customer-oriented Public Transport

(1) Road-based Public Transport

In order to solve the problems of the public transport discussed in Section 7.1.4, and to develop a customer-oriented public transport system, it is necessary to (A) increase the bus transport capacity to be able to serve the surging travel demand, (B) improve the bus service levels, and (C) reduce traffic congestion due to public transport. To achieve the above goals, it is indispensable to (D) improve the management ability of bus operators. Figure 7.3.33 shows the policies with corresponding measures.
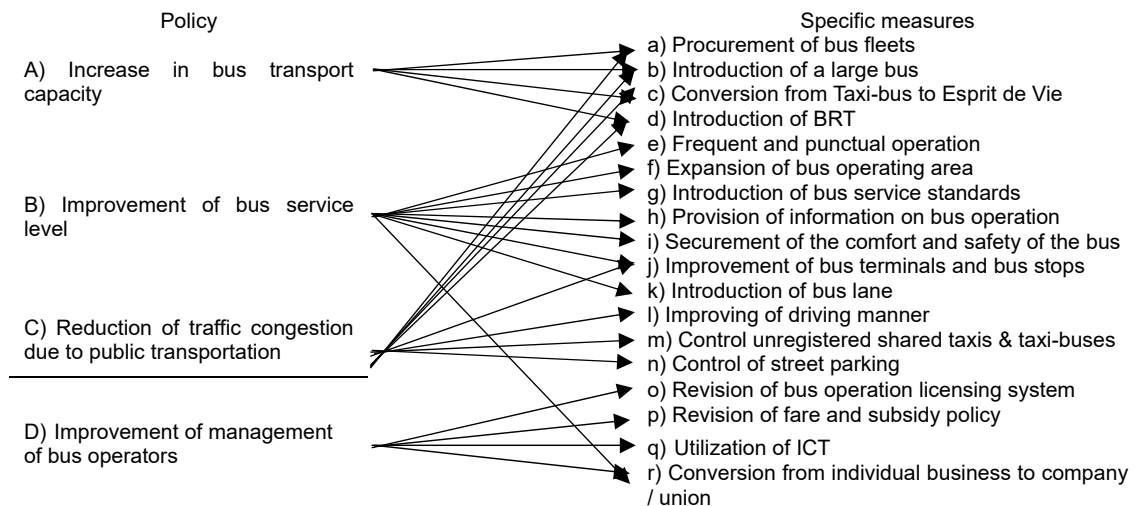
Source: The Study Team

Figure 7.3.33   Policy and Specific Measures for Road-based Public Transport

a) Procurement of bus fleets

There is a shortage of conventional large buses in Kinshasa City. Large buses are operated by public bus operators such as the Transco and the New TransKin. Since their fares are substantially lower compared with other private bus and taxi operators, chronic congestion occurs. Additionally, travel demand is expected to significantly increase during the coming decade. For this reason, Transco and New TransKin need to promote the procurement of new bus fleets.

b) Introduction of a large buses

Transco introduced many large buses, but most of the New TransKin's fleet consists of medium-size buses, and the number of large buses is limited. Therefore, when upgrading the bus fleet, large buses should be selected for trunk route services.

c) Conversion from Taxi-bus to Esprit de Vie

A taxi-bus has the capacity of only 16 passengers, and the Esprit de Mort type is old and notorious for its frequent traffic accidents and breakdowns (left photo of Figure 7.3.34). Therefore, the government needs to provide incentives to encourage the Taxi-bus owner to shift to Esprit de Vie, which has a capacity of 30 passengers (right photo of Figure 7.3.34). In the long term, it is expected that Esprit de Vie also will be operated by a company or union, to avoid excessive competition among drivers looking for passengers.

Taxi-bus (*Esprit de Mort*)   Minibus (*Esprit de Vie*)

Source: The Study Team

Figure 7.3.34   Examples of Taxi-bus (*Esprit de Mort*) and Minibus (*Esprit de Vie*)

d) Introduction of BRT

A mass transit system should be introduced on routes that have a demand that is too high to be handled with the existing buses. BRT is a major mass transit system, which carries out scheduled and high-frequency services through a dedicated lane or priority lane, and sometimes with articulated buses as shown in Figure 7.3.35. Although BRT has a lower transport capacity than other mass transit systems (such as LRT and urban railway), its initial investment cost is low and it is easier to introduce. The main features of BRT are as follows:

- Dedicated bus lanes: Bus-only or bus priority lanes allow buses to operate fast, on-time, and without impacts from road congestion (Figure 7.3.36).

- Off-board fare collection: Bus passengers pay fare at the station and not on the bus, in order to avoid the delay caused by passengers waiting to pay on board (Figure 7.3.37).

- Platform-level boarding: Bus passengers including wheelchair users can board on and off the bus from/to the platform easily and quickly, minimizing delay (Figure 7.3.38).

- Intersection treatments: To avoid traffic traversing the BRT lane, intersection treatments such as constructing a grade separated junction are necessary. However, if this is difficult, a PTPS (Public Transportation Priority System) needs to be introduced so that BRT operation can be performed without being affected by other traffic (Figure 7.3.39).

| Articulated Bus of BRT in Strasbourg, France | Bus of BRT in Hanoi, Vietnam |

Source: The Study Team

Figure 7.3.35   Examples of Fleets for BRT

| Bangkok, Thailand | Jakarta, Indonesia |

Source: The Study Team

Figure 7.3.36   Examples of Dedicated Lane for BRT System

Source: The Study Team

Figure 7.3.37   Examples of Off-board Fare Collection of BRT in Bangkok, Thailand
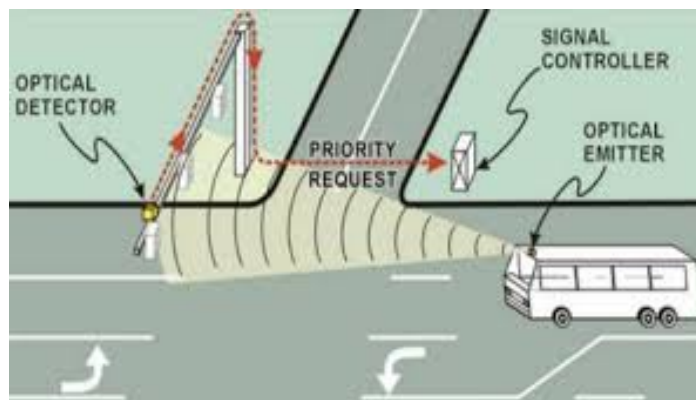
Hanoi, Vietnam

Guatemala City, Guatemala

Source: The Study Team

Figure 7.3.38   Examples of BRT Platforms

Source: New York City Department of Transportation. Transit Signal Priority, Staten Island, New York. Online. Internet. Available on 11th July, 2018 http://www.nyc.gov/html/dot/downloads/pdf/victoryblvd_tsp.pdf

Figure 7.3.39   Concept of Public Transport Priority System

e) Frequent and punctual operation

To improve the service level of the bus, bus operators need to prepare timetables and follow it to achieve a fixed schedule system; this reduces waiting time of passengers.

f) Expansion of bus operating area

Public bus companies should operate buses in areas with low population and areas, where it is difficult to provide bus services.

g) Introduction of bus service standards

To evaluate bus service, service standards should be established, and service licenses should be issued only when the bus operator satisfies them. In addition, when the bus operator violates the established standards, measures should be taken to improve the service level and meet the standard again. Below are some of the service standards that should be introduced:

- Is the bus operated as planned?

  - Is the bus traveling on a determined route?

  - Is the bus stopped at a fixed bus stop?

  - Is the bus departing from the bus terminal at a fixed time?

- Is bus failure rate/accident rate low?

- Is the bus properly maintained?

- Is the bus driver observing the traffic regulations?

h) Provision of information on bus operation

To improve the convenience of the bus, the central government and Kinshasa City, in addition to the bus operators, need to make efforts to display service information, such as bus routes and destinations.

i) Securement of the comfort and safety of the bus

To ensure the comfort and safety of the service, bus operators should promote the cleanliness of the buses, improve the quality of the seats, and introduce air conditioning. In addition, to ensure safe driving, it is necessary to abolish the commission system and retrain the drivers to improve their manners.

j) Improvement of bus terminals and bus stops

Currently, some busy bus stops such as the one in front of a market do not have any layby. The number of buses, minibuses, taxi-buses and share taxis waiting for passengers parked on the street disrupts other traffic. Bus stops and terminals should be designed so as to not disrupt other traffic and accommodate passenger demand at the stop, such as a layby with enough space for boarding/alighting and a bus shelter with a roof. For the area with high boarding, alighting and transfer passenger demand, a bus terminal should be constructed to minimize impact on roads and maximize the convenience of passengers. Bus stops and terminals should be located at nodes for connection with other modes of transport, such as railway stations and BRT stations.

Victorie

Gare Central

Source: The Study Team

Figure 7.3.40   Images of Current Bus Terminal in the Study Area

Kuala Lumpur, Malaysia

Tokyo, Japan

Source: The Study Team

Figure 7.3.41   Examples of Bus Terminal Development

k) Introduction of bus lane

Dedicated bus lanes and/or bus priority lanes should be introduced on roads with four or more lanes connecting suburbs and the city centre, so that the travel speed of large- and medium-sized commuter buses increase, to then attract more passengers.

Nagoya, Japan

Hanoi, Vietnam

Source: The Study Team

Figure 7.3.42   Example of Bus Priority Lane

l) Improving of driving manner

Like many cities in developing countries, most drivers of a minibus, taxi-bus and shared taxi (*Ketch*) do not follow traffic rules and regulations. For example, the bus drivers park at the intersections to pick up or drop off passengers, even sometimes occupying two or three lanes. There are several reasons, such as excessive competition, lack of education to drivers and limited law enforcement. It is necessary to tighten the law enforcement and educate the drivers.

m) Control unregistered shared taxis and taxi-buses

As discussed in Section 7.1.4, the Provincial Government of Kinshasa and the PNC commenced tight control of shared taxis since 2018. While attention was paid to the yellow-coloured taxis, law enforcement on the registration of taxi and taxi-bus operation is the key point for appropriate operation. It is expected to continue strict law enforcement of taxi and taxi-bus registration as drivers can easily start their business with sub-standard second-hand cars.

n) Control of street parking

The shared taxis and taxi-buses waiting for passengers are causing severe congestion around intersections. Therefore, on-street parking in the vicinity of the intersections should be prohibited for all type of vehicles, and the bus stop locations should be changed.

o) Revision of bus operation licensing system

While bus and taxi operation licensing is an effective tool to enforce safety and service standard, and control supply of vehicles, the current licensing is generally ad-hoc. The number of bus route permits should be limited, but not exceeding the passenger travel demand. The permits also should be given to operators who fulfil the service standards discussed in g) and owns vehicles with appropriate vehicle inspection for public transport. Thus, the Provincial Government of Kinshasa should have a system to understand the passenger travel demand such as periodical traffic survey on bus passengers and an inspection scheme, to verify the compliance of the service and safety standards.

p) Revision of fare and subsidy policy

The current fares of CDF 500 to CDF 700 as of July 2018 are not sufficient for safe, convenient and comfortable operation of public transport, according to Transco. While Transco receives substantial subsidies by means of bus fleets and fuels, private operators increases their revenue by dividing a route into several sections. This results in the concentration of passengers to the Transco buses, while the number of fleets is limited. This implies that the regulation on public transport fares is not properly functioning. It also should be noted that changes in fares are highly political, not only in the Kinshasa City but also in other cities in the developing world.

Therefore, a transparent and evidence-based fare policy is required. An independent and transparent committee is expected to establish to determine public transport fares, based on evidence to avoid political intervention. The committee should examine the fare from the viewpoint of the required funding for safe, convenient and comfortable operation of public transport, fairness for all users of public transport, and fair market for business owners. Accessibility of low-income households, students and people with disabilities also should be taken into account for them afford to travel in the Study Area. As funding is required for the subsidy, the

ear-marking of revenue from the TDM policy is an option to be considered.

q) Utilization of ICT

To improve bus operation and services, major bus companies should introduce new systems using ICT (information and communication technology) in the future. For example, the introduction of an automatic fare collection system to collect fares in cashless system using IC cards and smartphones, and a bus location information management system to monitor the route and operation status in real time and to support the scheduled operation, will be effective for the operation of the bus and stabilization of the company's management. In addition, introduction of a bus location system for passengers, which shows the bus operation information on displays installed in buses and bus terminals, will be effective in increasing passenger bus usage frequency.

r) Conversion from individual business to company/union

As discussed in Section 7.1.4, the majority of buses and taxis are operated by individuals under commission-based salaries. This initiates excessive competition among drivers. There is less incentive for them to comply with traffic rules and improve the service level for passengers. Therefore, it is recommended to form a company or a union for bus and taxi operation and to introduce monthly salaries. This can be achieved by introducing safety and service standards, as it is not easy for individuals and small bus operators to fulfil the standard, while large bus companies can enjoy scale merit for improving the maintenance level.

(2) Railway Transport

a) Conversion from the inter-city service to the high capacity urban railway service

The current railway service in Kinshasa City is far from the urban railway service in terms of frequency, speed, capacity and service level. The operational character of the current railway service in the Study Area is long distance oriented with a locomotive and coaches, and low frequency operation of one round-trip per day. A fundamental transformation of railway service to an urban rapid transit is required to serve the tremendous passenger travel demand in the future, especially in 2040.

To serve the huge passenger demand and minimize waiting time for passengers, frequent train operation such as one train in every 10 to 20 minutes is prerequisite. Stop spacing also should be shorter, such as every 1 to 2 km, to be accessed by residents along the railway corridor. Scheduled speed also should be higher such as 30km/h.

This means that all components of the railway system such as infrastructure, rolling stocks, signalling, and telecommunication and management system should be competent with operation as an urban railway service.

The rail track needs to be renovated for high speed operation such as 60 to 80 km/h. Double tracking is also required for frequent operation in the long term. As frequent train operation disrupts road traffic and causes railway and road accidents, it is recommended to be grade-separated (elevated) in the urbanized area in the long term (Figure 7.3.43).

| Elevated Railway Track and Traffic Congestion | Interior of EMU |

Source: The Study Team

Figure 7.3.43   Image of Urban Railway Service in Bangkok, Thailand

A railway station should be added for convenient access to the residents along the line such as every 1-2 km. The station also can be equipped with ticketing machines, automatic ticket checking system, escalator and elevator as required (Figure 7.3.44).

| Elevated Railway Station in Bangkok, Thailand | Staition Platform in Bangkok, Thailand |

| Automatic Ticket Checking System in Depok, Indonesia | Ticketing Machines in Singapore |

Source: The Study Team

Figure 7.3.44   Images of Railway Stations and Station Facilities

Apart from the current signalling and telecommunication using mobile phones, an electric signalling system should be installed. ATP (Automatic Train Protection) is recommended to avoid collision of trains due to signal oversight. Besides, CTC (Centralized Traffic Control) can be employed to improve work efficiency by centralizing the route control work of each station.

Rolling stocks also should have enough capacity and speed to be served for the urban railway service. A DMU (Diesel Multiple Unit), especially a DEMU (Diesel–electric Multiple Unit), is a typical option for urban railway service in case the railway line is not electrified. In case frequency is high and there is no issue in power supply, installation of an EMU (Electric Multiple Unit) in conjunction with railway electrification is an option to be considered (Figure 7.3.43) in the medium and long term.

To serve as an urban railway system, improvement of the service level for passengers in terms of punctuality, speed, safety, security, convenience and comfort is critical. In addition to infrastructures, signalling, telecommunication and rolling stocks, establishment of a maintenance scheme, capacity building of human resources, efficient management of the operating body and subsidies to cover losses are essential.

**b) Utilization of affordable railway development options**

As discussed in Section 7.1.8, there is a shortage of funding especially for infrastructure development. Although the railway is one of the most expensive public transport modes, especially for initial cost, there are several affordable options available for the railway in the Study Area. These options should be taken into account especially for urgent and short-term development plans.

The only urban railway line currently under operation in Kinshasa City is the line toward Kasangulu, a city around 45km from Kinshasa Central Station, via Kimwenza, around 23km from the Central Station, sharing the same track with the Matadi-Kinshasa railway while the railway lines to Kintambo and N'djili Airport are not in operation as of July 2017. The line to N'djili Airport has stopped operation since 18th September, 2015 due to financial problems while the line to Kintambo terminated the train operation in 2007. These lines except for the abandoned line to Kintambo can be renovated with relatively small investment. However, lands of the line to Kintambo are occupied by some residents as 10 years have passed since the last operation. For the short-term, railway lines to Kasangulu and the airport can be utilized.

Source: The Study Team, 2016

Figure 7.3.45   Track of Abandoned Airport Line (around Masina)
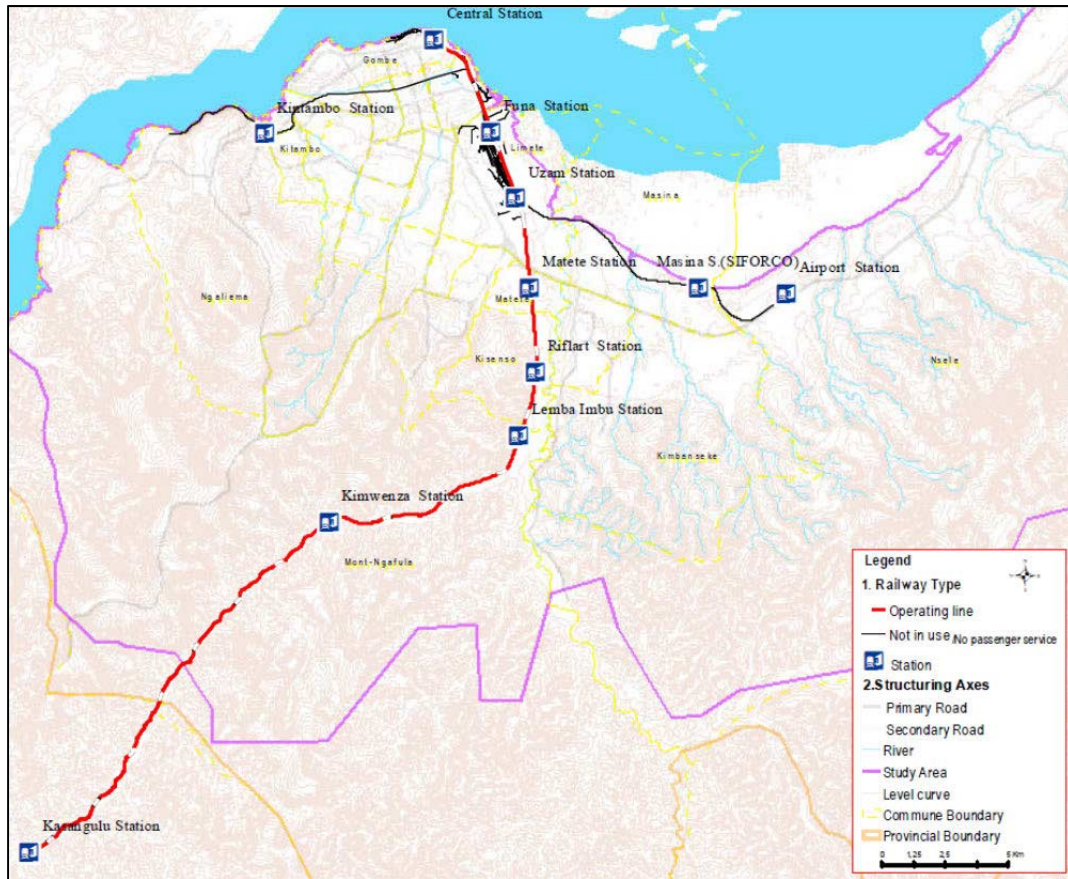
Source: The Study Team based on interview to SCTP and GIS data from CI in 2016

Figure 7.3.46   Current Railway Network of SCTP in the Study Area

Second-hand rolling stocks are also affordable options. As long as the railway gauge is 1,067 mm, second-hand DMUs from Japan can be utilized in the railway track in Kinshasa. For instance, the gauge of JR (Japan Railways) is also the same as the railway track in the Study Area. There are also examples of grant of railway rolling stocks in Yangon, Myanmar and Jakarta, Indonesia as shown in Figure 7.3.47.

Japanese Second-hand DMU in Yangon, Myanmar

Japanese Second-hand EMU in Jakarta, Indonesia

Source: The Study Team

Figure 7.3.47   Examples of Japanese Second-hand Rolling Stocks

c)   Improvement of railway administration and institution

The railway between Matadi and Kinshasa City is solely operated by the state enterprise, SCTP (*la Société Commerciale des Transports et des Ports*) under *Ministère de Transport et Voies de Communications* (the Ministry of Transport and Communication). The railways department is one of five departments generating revenue in the SCTP. According to the SCTP annual report, more than 60% of the staff of the railways department is over 50 years old. There is a clear trend that the higher the age group is, the more the number of staff is. It is evident that the number of young staff is significantly scarce. The railway division has 6 divisions, and, the urban railways division with approximately 120 staffs is the smallest one. Among a total of approximately 120 staffs, 49 staffs are in management positions. The ageing problem of the organization might be affecting this significant share of management staff.

However, the railway business involves technical experts from a wide range of fields and is supposed to work as one organization using diverse expertise and skills. Since the railway itself is a system, the company's management organization must be able to integrate each of the relevant technologies. At the same time, a streamlined management structure is necessary to ensure low operating costs, favourable cost performance, and sustainable operations.

It is important for government administration to respect the independence and the self-motivated business discretion of railway operators to further enhance their operations. Meanwhile, the

administration is required to secure user convenience and safety for the sake of user protection.

Hence, the government is expected to establish a mechanism to ensure adequate standards of transport services (in terms of safety, stability, fares, security, etc.). In Japan, the Railway Enterprise Law was established to provide the following: implementation of inspection and specification verification by the administration upon completion of railway facilities and rolling stock, obligation of accident/disaster reporting, the authorization system and notification requirement of fares and fees, and such. In addition, the Railroad Operation Law was established to address basic concerns regarding safety requirements and provide a licensing system for railway drivers as well as technical standards for railway facilities.

In recent years, there have been some cases where the railway infrastructure sector requiring huge amount of initial investment and the operational sector remain separate. This is called the vertical separation system. Vertical separation is done in cases where multiple companies need to run trains on a single line and/or governmental and other public funds are used for the infrastructure sector to finance the railway construction. When adopting a vertical separation system, it is necessary to pay careful attention to setting the proper rate of facility lease, investment for facility improvement, and risk sharing. The example of role sharing of railway business in Bangkok, Thailand is described in Table 7.3.7.

**Table 7.3.7   Example of Role Sharing of Railway Business in Bangkok, Thailand**

Party	Key Responsibility	Allocated / Retained Risk
Government	- Supervison of railway operators from user-oriented perspective - Define "Requirements" (Performance specs, operation, maintenance & service standards & specs); - Enforce "Requirements" - Fare policy - On time delivery of Infrastructure - Manage works interface - On time delivery of works site - Support with permits, electricity tariff, tax privileges	- Those design & interface risks due to Requirements & interface management - Socio-economic benefits below level of desired EIRR - 'Abnormal' (defined) economy having adverse financial impact on BMCL - Policies, action, legislation adverse financial impact on BMCL
Bangkok Expressway and Metro Public Company Limited (BMCL)	- Comply with Requirements - Interface as directed by the Mass Rapid Transit Authority of Thailand - Design & on time delivery of Equipment - Revenue service including fare collection & use; maintain all railway assets; renew & augment as needed - Transit-linked commodity development - Fund Concession - Pay Concession Fee and any Excess Profit sharing to the Mass Rapid Transit Authority of Thailand	- Compliance (including time) and cost in Equipment delivery - Residual risk Infrastructure defects - 'Normal' (defined) ridership risk - 'Normal' funds sourcing risk - 'Normal' compliant operation and maintenance risk - 'Normal' financing and exchange risks

Source: Mass Rapid Transit Authority of Thailand and Bangkok Expressway and Metro Public Company Limited, edited by the Study Team

7.3.6   Accessibility for All

(1) Transport Options for Low Income Household

As mentioned in Chapter 2, half of trips made in the Study Area are by NMT (Non-motorized Transport). The lower the household income is, the higher the share of non-motorized transport trips as shown in Figure 7.3.48. For the group with monthly household income of USD 25 to 100, two thirds of trips are made by the NMT. Mainly due to financial constraint, there is no options but to choose the NMT.
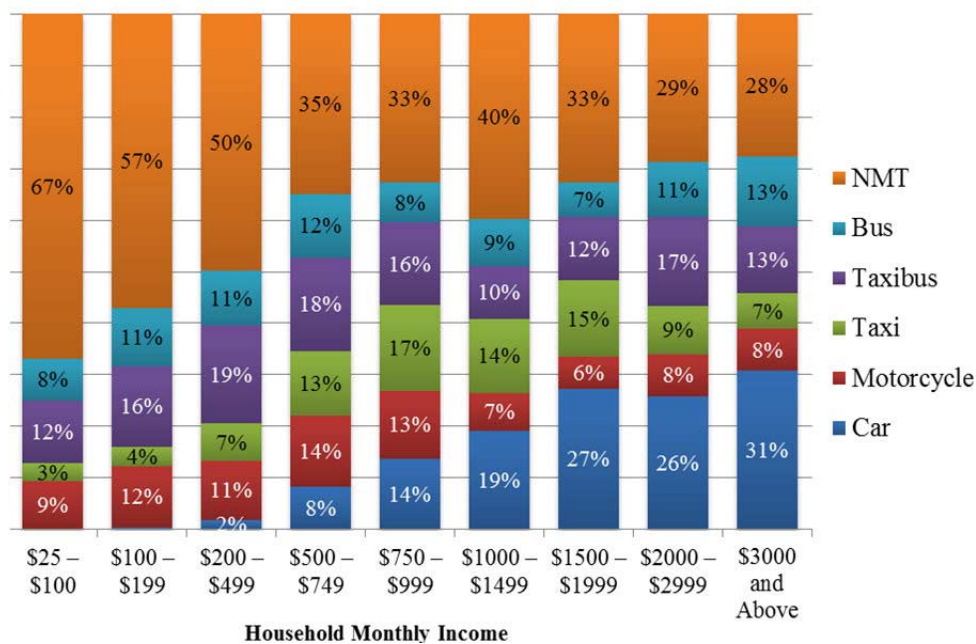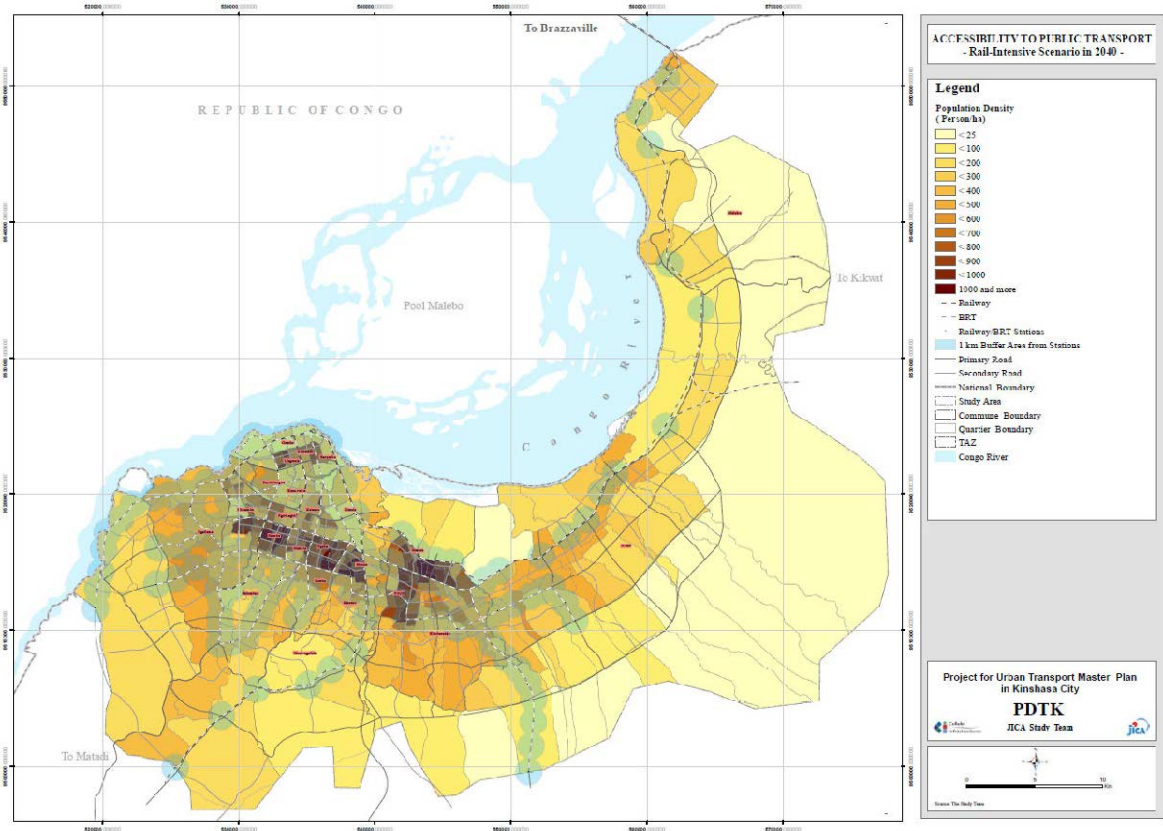

Source: The Study Team

Figure 7.3.48   Modal Share by Household Monthly Income

While lowering public transport fare is an option, it can function as a virtual subsidy from non-public transport users to frequent users of public transport. Considering the amount of benefits received from the use of public transport, it is not fair for non-users. Distribution of public transport tickets for low income households can be an option to avoid this issue.

In addition, reliable public transport systems such as railways and BRTs should be accessible, or within walking distance such as 1km, for a majority of residents in the Study Area for them to have easy access to job opportunities, schools, medical facilities and shopping. The railway and BRT routes should be aligned to be accessed by as many residents as possible while there is limitation in funding.

Source: The Study Team

Figure 7.3.49   Accessible Area within 1km from Stations of Railways and BRTs in 2040 (Rail Intensive Case)

(2) Improving Environment for Non-motorized Transport

Despite the fact that people are dependent on non-motorized transport in the Study Area, most of the roads are inaccessible for people with disabilities. Figure 7.3.50 shows typical examples of barriers in the Study Area. Even for people with no disability, barriers disrupt their movement.

Deteriorated pedestrian pavement, Avenue Bongolo

Pedestrian crossing a creek in Bumbu Commune

Pedestrians crossing 8-lane Bld. Lumumba

Hilly Avenue Elengesa with garbage

Avenue Itaga occupied by street venders

Inundated Avenue Kikwit with garbage

Source: The Study Team

Figure 7.3.50   Example of Barriers for Pedestrians

Therefore, improvement of the walking environment is highly awaited. However, priority given to walking facilities for entire roads in the Study Area cannot be completed in the short term. As discussed in Section 7.3.3, roads to be renovated and constructed should be equipped with

pedestrian footways as shown in the typical cross-section of roads. Priority also should be given to transfer points of public transport such as railway stations, bus terminals, and roads around key urban facilities such as medical facilities, educational facilities, markets etc. Major roads in the CBD (Central Business Districts) also can be prioritized as many people are concentrated in those areas.

In the long term, it is expected to formulate a continuous network of the walking environment and bike lanes for bicycle users. For the implementation of improving the walking environment, community-driven development, which gives control over planning decisions and investment resources to community groups including community involvement in implementation, operation and maintenance, can be applied as unemployment of the youth is a national problem. It enhances transparency, participation, accountability, and enhanced local capacity.

| Pedestrian Footpath & Bicycle Lane | Street with Bench | Open Street Café |

Source: The Study Team

Figure 7.3.51   Images of Improvement of Walking Environment in Strasbourg, France

(3) Barrier-Free Transport for All

The 2006 United Nations Convention on the Rights of Persons with Disabilities, which is also ratified by the DRC, in particular, provides that: "States Parties shall take appropriate measures to ensure to persons with disabilities access, on an equal basis with others, […] to transport" (article 9). Regardless of personal attributes on mobility, accessible options should be provided for their daily life. For various types of people with limited mobility, significant policy intervention is required taking inaccessible condition in the Study Area into consideration. The types of people with limited mobility includes the elderly, the physically impaired (wheelchair users), the physically impaired (non-wheelchair users), persons suffering from an internal disorder, the visually impaired, persons suffering from a hearing or speech disorder, the mentally impaired, foreigners and others. To develop a mobility environment for them, regulation, technical standards and guidelines for roads, passenger facilities, passenger coaches and buildings are required. These are principles to be followed for the development of accessible environment.

1) Pathway easy to follow: A barrier-free pathway should be the shortest route and easy to understand so that elderly persons, the physically impaired and other people with limited mobility can follow it safely and comfortably.

2) Easy understanding guidance: To assist elderly persons, the physically impaired and other people with limited mobility, the area should be organized such that anyone can know his or her way and they should be provided with appropriate guidance.

3) Facilities and equipment easy to use: Facilities and equipment should be safe, easy to use, and easily accessible for elderly persons, the physically impaired and other people with limited mobility.

While the detailed technical aspects are described in other reference documents such as "A Practical Guidance Note - Improving Accessibility to Transport for People with Limited Mobility (PLM)" by the World Bank (2013), examples of barrier free facilities are described in Figure 7.3.52.
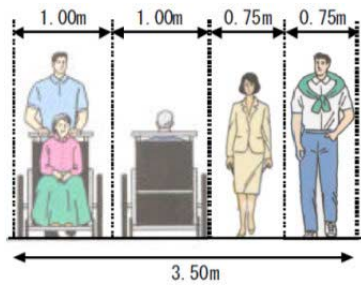
1) Typical cross section of pedestrian pathways (1)
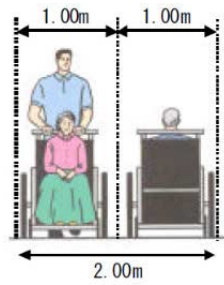
2) Typical cross section of pedestrian pathways (2)

3) Slope facility with handrail at a railway station, Singapore

4) Elevator at a railway station, Singapore

5) Tactile for the visually impaired, signage and an escalator, Japan

6) Platform door in Bangkok, Thailand

7) Accessible toilet at a railway station, Japan

8) Space for wheelchair users in a bus coach, Japan

9) Slope facility of public bus, Japan

Source of 1) and 2): Barrier-Free Guideline for Roads Development (道路の移動円滑化整備ガイドライン) (2003) edited by the Ministry of Land, Infrastructure, Transport and Tourism, Japan, issued by the Japan Institute of Country-ology and Engineering (JICE)

Source of 3) and 4): The Study Team

Source of 5) and 7): Manual for Guidelines to Improve Barrier-Free Access for Public Transport Passenger Facilities (バリアフリー整備ガイドライン　旅客施設編　解説集) (2014), the Foundation for Promoting Personal Mobility and Ecological Transportation (Eco-Mo Foundation)

Source of 6): The Study Team

Source of 8) and 9): Guidelines to Improve Barrier-Free Access for Public Transport Vehicles, Vessels and Aircraft (バリアフリー整備ガイドライン　車両等編) (2013), edited by the Ministry of Land, Infrastructure, Transport and Tourism, Japan, issued by the Foundation for Promoting Personal Mobility and Ecological Transportation (Eco-Mo Foundation)

Figure 7.3.52　Example of Barrier Free Facilities

7.3.7 Managing Traffic Flow and Safety

Traffic safety, control and management policies have been established to help achieve various objectives, as described below.

(1) Traffic Flow

To ensure smooth traffic flow, comprehensive parking management is necessary. Bottleneck points must be improved after analysing the causes of problems and examining possible improvement measures, which may include intersection geometry and signal improvements.

To ensure smooth traffic flow in Kinshasa City, comprehensive traffic management is necessary and the following important issues must be tackled.

a) Eliminate bottlenecks

The road network needs to be expanded to handle the increasing number of vehicles, but it is difficult to accomplish this in a short span of time. On the other hand, there is significant potential for reducing bottlenecks at intersections by coordinating traffic signal timing according to traffic demand and by improving the geometric design of intersections to reduce traffic conflicts.

b) Improve parking management

Parking systems are composed of two types, on-street and off-street. A parking management programme should take the roles of on-street and off-street parking facilities into consideration.

c) Transport demand management

TDM is the application of strategies and policies to reduce travel demand, or to redistribute this demand in space or time. Typical TDM approaches are route change, peak hour shift, mode change, efficient car use, and trip reduction. The measures aim to reduce the number of private vehicle trips or their peak directly by restricting vehicle use or indirectly promoting the attractiveness of other modes of transport.

d) Efficient public transportation

Efficient busways need to be introduced, and it is recommended to equip them with a bus location system which can capture the real time location of vehicles. These systems can be utilized by riders to look up real-time bus arrival and departure information and by operators as a vehicle management system to improve service reliability. It is also important to consider how to control left turn movements at median busway intersections for smooth traffic flow.

(2) Traffic Safety

To ensure traffic safety, it is important to consider the plan from the context of the five strategic pillars described in the "Global Plan for the Decade of Action for Road Safety 2011-2020" by the WHO/UN in the African Action Plan as shown in Figure 7.3.53.

Traffic safety is a nationwide issue and traffic safety policy for Kinshasa City should be developed in line with the national road safety strategy for the DRC.

Pillar 1	Pillar 2	Pillar 3	Pillar 4	Pillar 5
Road safety management	Safer roads and mobility	Safer vehicles	Safer road users	Post-crash care
Gestion de la securite routiere	*Sécurité des routes et mobilité*	*Sécurité des véhicules*	*Comportement des usagers de la route*	*Soins après l'accident*

Source: Global Plan for the Decade of Action for Road Safety 2011-2020, WHO/UN

Figure 7.3.53   Five Strategic Pillars for Road Safety (English/*French*)

a) Road safety management

To implement a modern road safety policy, a functioning lead agency, substantial coordination between relevant public and private institutions, an accident database system, and developing a road safety action plan are required. It will take time to establish institutional frameworks nationwide; therefore, it is recommended to start with what the local authorities can tackle, such as developing an accident database, capacity building, and developing local research and road safety monitoring.

b) Safer roads and mobility

Road safety should be given appropriate consideration in infrastructure development including facilities for pedestrians and other vulnerable road users. To ensure basic safety conditions, road safety audits should be carried out throughout planning, design, construction, and operation stages.

c) Safer vehicles

Poor standards and regulations for vehicles contribute to a significant number of road accidents. Basic standards and regulations for vehicles should be controlled at the national level, but considering the private sector has an important role to play in updating the commercial fleet, local governments should regulate depending on their transportation circumstances. Regulations should be considered for buses, taxis, and trucks, as well as related safety equipment, such as seat belts, and helmets (for motorcycles). Law enforcement needs to be strengthened to ensure compliance with international standards.

d) Safer road users

The licensing system for private, commercial, and public transport drivers needs to be reviewed. Legislation and institutional frameworks related to driving schools, training for instructor, driving test method, driver's license system and passenger transport need to be modernized. Law enforcement in a fair and equitable manner is critical to enhance road safety. To ensure adherence to basic safety standards, regulation of the following issues is critical: speed limits, seat belts, alcohol, helmets and fatigue management. Education and awareness activities are essential for providing information on road safety and for periodically reminding road users.

e) Post-crash care

Post-crash care diagnostics should evaluate capabilities and practices of emergency services for road crash victims on national roads including on-site management, transport of victims to

hospitals, emergency and trauma care services for the injured, and coordination and financing of stakeholders involved in post-crash services. Emergency equipment and training for accident on-site care, communication systems and ambulance service along priority roads are the first steps to be taken.

7.3.8 Coordination, Human Resources and Funding to Implement Project

As a result of study of current situations described in Section 7.1.7, it is found that there are mainly three institutional issues, namely lack of coordination, human resources and funding to implement projects. In order to improve the situation, the Study Team sets the following policies for planning appropriate institutional framework to implement the urban transport master plan.

- To establish a feasible and sound institutional framework for implementation of the Urban Transport Master Plan by establishing a council for coordination, planning and monitoring progress of the Urban Transport Master Plan, but not to establish a physical entity (up to the year 2030).

- In accordance with the national development strategy, political and economic situation, to make a gradual transferring plan to a resilient institution as a governmental permanent organization in year 2040 which can deal flexibly with changes under such circumstances.

The situation of each issue and its countermeasures are described below.

(1) Coordination

In the urban transportation sector in the Kinshasa City, there are various agencies at any level and sector involved in each stage. This means that it frequently requires constant and close cooperation among multiple agencies, and it is also expected to formulate consistent policies. However, several issues are observed such as ambiguity of responsibilities, insufficient occasions for information sharing, parallel and individual permissions for cross-cutting issues and/or governmental and local issues, no linkage for pricing and changing transportation modes, discrepancies in policies between the national government and the provincial government.

In order to improve the situation, the Study Team proposes to establish a council in charge of coordination among all agencies in urban transport sector, monitoring the progress of the urban transport master plan and periodically revising the urban transport master plan. It is assumed that the council is a provisional coordinating body, and, managing board members as well as staff of the core working unit are from central and local government agencies in charge of the urban transport sector. It is expected that the council is established with necessary and sufficient legal status for fulfilling coordination, monitoring and planning roles.

(2) Human Resource

In this country, as a common issue across several industries and sectors, it is said that the workforce has been facing accelerated ageing for a long time due to aged persons' remaining after their reaching retirement age. It can also bring difficulties on the smooth transferring of skills and knowledge among each organization. Thus, there are not enough young engineers in spite of the large number of engineers, so that each agency has qualitatively and quantitatively insufficient human resources. In order to address the situation, the Study Team proposes that it is imperative for each agency to correctly manage human resources. This means that each agency needs to

employ persons at working age and provide suitable support to enhance their abilities, even if it's very difficult to change the situation brought by the economic instability.

(3) Funding

The difficulties in fund raising and insufficient budget are a national problem in the DRC as discussed in Section 7.1.8. While the current budget for the urban transport sector in the Study Area is limited, the increase of tax revenue along with economic growth and other sources of fund described in Table 7.3.8 is expected. Even if the budget is allocated for a project, it is sometimes not executed or only partially executed, due to various reasons such as political intervention, sudden change of budget allocation plan as discussed in Section 7.1.8. Thus, it is essential to formulate a transparent budgeting system.

Table 7.3.8   Major Funding Sources for Project Implementation

Type of Fund	Description
Central and local government budget	While the annual available amount is limited at this moment, it is expected to increase along with economic growth.
FONER	Significant increase of budget can be expected due to motorization and increase of price per litre as automobiles are major causes of traffic congestion. The current USD 0.10 per litre for fuel and USD 0.20 per litre for lubricant should be raised considering economic externalities of motorized vehicles.
TDM (parking tax)	Parking tax as a part of TDM policy can be revenue of the government. The price level can be adjusted depending on the congestion level.
Property tax for urbanized area	Additional property tax can be applied for the urbanized area for funding of required infrastructure in urban areas.
Fare of public transport	Fare of public transport operated by public companies can be utilized not only for operation and maintenance but also partially for initial investment of public transport while it is not possible to cover entire initial investment of public transport.
Land value capture	For the new urban development of suburban areas, infrastructures including roads should be developed by the developers including private developers. For the area around railway station, higher FAR can be applied. This value should be captured by urban redevelopment project or selling of additional FAR to private sector etc.
Multi-lateral donors	Grants and loans from the World Bank, African Development Bank, and EU are expected.
Bilateral donors (Members of DAC)	Grants and loans from member countries of DAC such as JICA, AfDB, Belgian Development Agency and DFID are expected.
Bilateral donors (non-members of DAC)	Grants and loans from non-member countries of DAC such as China are expected.

Note: DAC stands for Development Assistance Committee of the Organisation for Economic Co-operation and Development (OECD)

Source: The Study Team

7.3.9   Reducing Negative Environmental Impacts

Given that the population of Kinshasa City will be double upto about 25 million by 2040, and that transportation demand will be 2.3 times of that of 2017; 12 pollution and social environmental items are expected to be affected without strategic planning and investments on transportation, as shown in the middle column below in Table 7.3.9.

To avoid and minimize the negative impacts and enhance the benefits from strategic planning and investments, the following eight policies are proposed:

1. Traffic congestion must be avoided, and the use of public transport must be encouraged to minimize vehicle emissions.

2. The use of private cars must be discouraged, and the use of public transport must be encouraged to reduce transportation fuel consumption and greenhouse gas emissions.

3. Future road plans must be shared with the public, and construction activities within public ROWs (Right of Way) must be discouraged to minimize the long-term relocation of homes and businesses.

4. Plans to expand existing roads and alignment plans for new roads must be developed in consultation with local institutions and residents to avoid negative impacts such as interference with of existing traffic and near road activities, the destruction of important historical and cultural resources, and the loss of street trees that are considered to be of importance to the local identity.

5. Effective communication and decision-making procedures for the implementation of the Master Plan must be put into place to give the public a fair and reliable process for providing input and air grievances and to help resolve complaints.

6. Kinois, especially children, women and the elderly must be benefited from affordable transportation and better access to work places, markets, schools, hospitals etc., even with the population doubling and urban areas expanding.

7. Businesses in Kinshasa City, including the markets, must be benefited from increased access to goods, consumers and workers.

8. Road and traffic safety must be improved and the number of traffic accidents per capita must be decreased.

Table 7.3.9   Expected Negative Impacts and Environmental Policies

No.	Items	Negative Impacts from lack of strategic planning and investments	Policies to Reduce Environmental Negative Impacts and Enhance Positive Impacts
1	Air quality	Greater expanse and higher levels of air pollution	1. Traffic congestion must be avoided, and the use of public transport must be encouraged to minimize vehicle emissions.
2	Climate change, transboundary impacts	Increased GHG emissions	2. The use of private cars must be discouraged ,and the use of public transport must be encouraged to reduce transportation fuel consumption and greenhouse gas emissions.
3	Involuntary Resettlement and/or Loss of Property	Occurrence of mass resettlement	3. Future road plans must be shared with the public and construction activities within public ROWs must be discouraged to minimize the long-term relocation of homes and businesses.
4	Social institutions such as social infrastructure and local decision-making institutions	Government decisions without local consent	4. Plans to expand existing roads and alignment plans for new roads must be developed in consultation with local institutions and residents to avoid negative impacts such as interference with existing traffic and near-road activities, the destruction of important historical and cultural resources, and the loss of street trees that are considered to be of importance to the local identity.
5	Divided communities	Loss of accessibility within once united communities	
6	Historical and cultural resources	Loss of resources due to the construction of new or expanded roads	
7	Natural Landscape	Loss of landmarks such as street trees	5. Effective communication and decision-making procedures for the implementation of the Master Plan must be put into place to give the public a fair and reliable process for providing input and airing grievances and to help resolve complaints.
8	Poor	Forced to walk long distances	
9	Local economy	Unreliable traffic conditions slow economic development	6. Kinois, especially children, women and the elderly, must be benefited from affordable transportation and better access to work places, markets, schools, hospitals, etc., even with the population doubling and urban areas expanding.
10	Traffic/public facilities, infrastructure, social services	Without good planning and investment, the availability and quality of services, facilities and infrastructure will remain insufficient	
11	Gender	Women, children and the elderly will have difficulty getting around the city	7. Businesses in Kinshasa City, including the markets, must be benefited from increased access to goods, consumers and workers.
12	Accidents, crime	Unruly driving and parking will continue, and per capita accident rates will increase	8. Road and traffic safety must be improved and the number of traffic accidents per capita must decrease.

Source: The Study Team