ISLAMIC REPUBLIC OF AFGHANISTAN
KABUL MUNICIPALITY
MINISTRY OF TRANSPORT

DATA COLLECTION SURVEY ON URBAN TRANSPORT IN AFGHANISTAN

FINAL REPORT

PART 1 DATA COLLECTION ON URBAN TRANSPORTATION

MARCH 2023

JAPAN INTERNATIONAL COOPERATION AGENCY
(JICA)
YACHIYO ENGINEERING CO., LTD.

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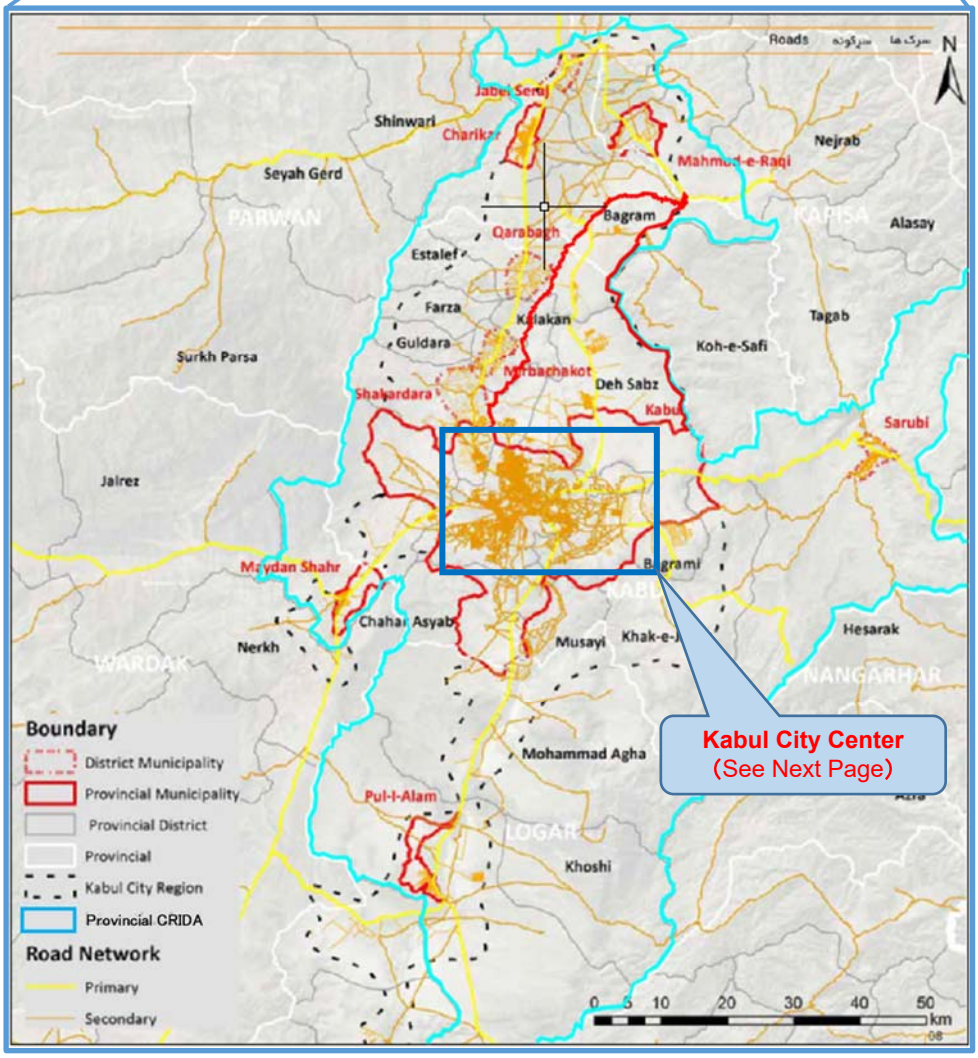
Maps of Study Area

ISLAMIC REPUBLIC OF AFGHANISTAN, Country Map

Kabul Metropolitan Area



Map of Kaul City Center（Traffic Condition in Kabul City Center）

Table of Contents

List of Figures

List of Tables

Abbreviations

ADB	Asian Development Bank
ADF	Asian Development Fund
AGCHO	Afghanistan Geodesy and Cartography Head Office
AGUTS	Afghanistan Green Urban Transport Strategy
AI	Artificial Intelligence
AMPDF	Afghanistan National Peace and Development Framework
BHLS	Bus with a High Level of Service
BRT／BRT M/P	Bus Rapid Transit / BRT Master Plan
CBD	Central Business District
CCTV	Closed-Circuit Television
CP	Counter Part
CRIDA	Capital Region Development Authority
DCDA	Dehsabz - Barikab City Development Authority
DF/R	Draft Final Report
EU	European Union
GIS	Geographic Information System
GPS	Global Positioning System
GRDP	Gross Regional Domestic Product
ICF	International Finance Corporation
ICT	Information Communication Technology
IC/R	Inception Report
IDA	International Development Association
IMEI	International Mobile Equipment Identity
IMTS	Intelligent Multimode Transit System
IoT	Internet of Things
IT/R	Interim Report
ITS	Intelligent Transport Systems
JICA	Japan International Cooperation Agency
KM	Kabul Municipality
KORR	Kabul Outer Ring Road
KUDF	Kabul Urban Design Framework
KUTEI	Kabul Urban Transport Efficiency Improvement Project
LRT	Light Rail Transit
MOI	Ministry of Interior
MOT	Ministry of Transport
M/P	Master Plan
MUDL	Ministry of Urban Development and Land
NPP／U-NPP	National Priority Program / Urban – NPP
OD	Origin Destination
OJT	On the Job Training

PEACE	Project for the Promotion and Enhancement of the Afghan Capacity for Effective development
PMU	Project Management Unit
PPP	Public Private Partnership
PT	Person Trip
TDM	Traffic Demand Management
TOT	Training of Trainers
USAID	United States Agency for International Development
UN-HABITAT	United Nations Human Settlements Programme
WB	World Bank

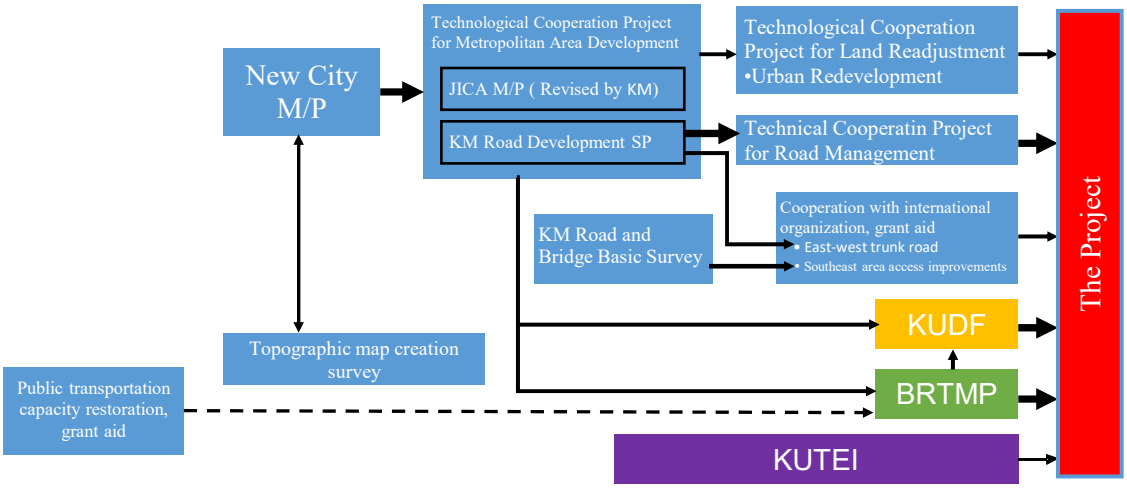
SUMMARY

Chapter 1 Introduction

1.1 Background of the study

The population of Kabul Municipality (hereafter referred to as "KM") continues to grow at the fastest pace in the world, from an estimated 1 million in 2001 to approximately 5 million in 2018 (Central Statistics Report). Traffic congestion in the center of the city, therefore, has been growing more intense each year.

While the need for cooperation in the field of urban transportation in Kabul remains high, it is necessary to accurately understand the current status and issues of urban transportation in Kabul in order to continue to provide effective cooperation with limited resources. It is necessary to create a unified master plan that reflects the above information. And it is also necessary to make a proposal regarding a comprehensive future cooperation policy for promotion of the implementation of the unified master plan and for development of priority projects.



Technical Cooperation Project for Road Management: Kabul Municipality road construction and management capabilities reinforcement project

Figure 1.1.1 Development of urban transportation infrastructure inside Kabul Municipality

1.2 Objectives of the study

Based on the background described above, the purpose of this survey is to collect and analyze the information necessary to investigate the support that should be provided to improve urban transportation in Kabul in the short- to medium- to long-term.

1.3 Targeted area

The target area shall be the Kabul Metropolitan Area.

1.4 Study framework

Our counterpart is Kabul Municipality (KM). The Ministry of Transport is also a counterpart, since the current public transportation (bus) service is operated by Millibus, which is under the Ministry of Transport. Kabul University also participated in the study as an advisor.

1.5 Study schedule

The flow of work implementation of this project is shown in Figure 1.5.1.

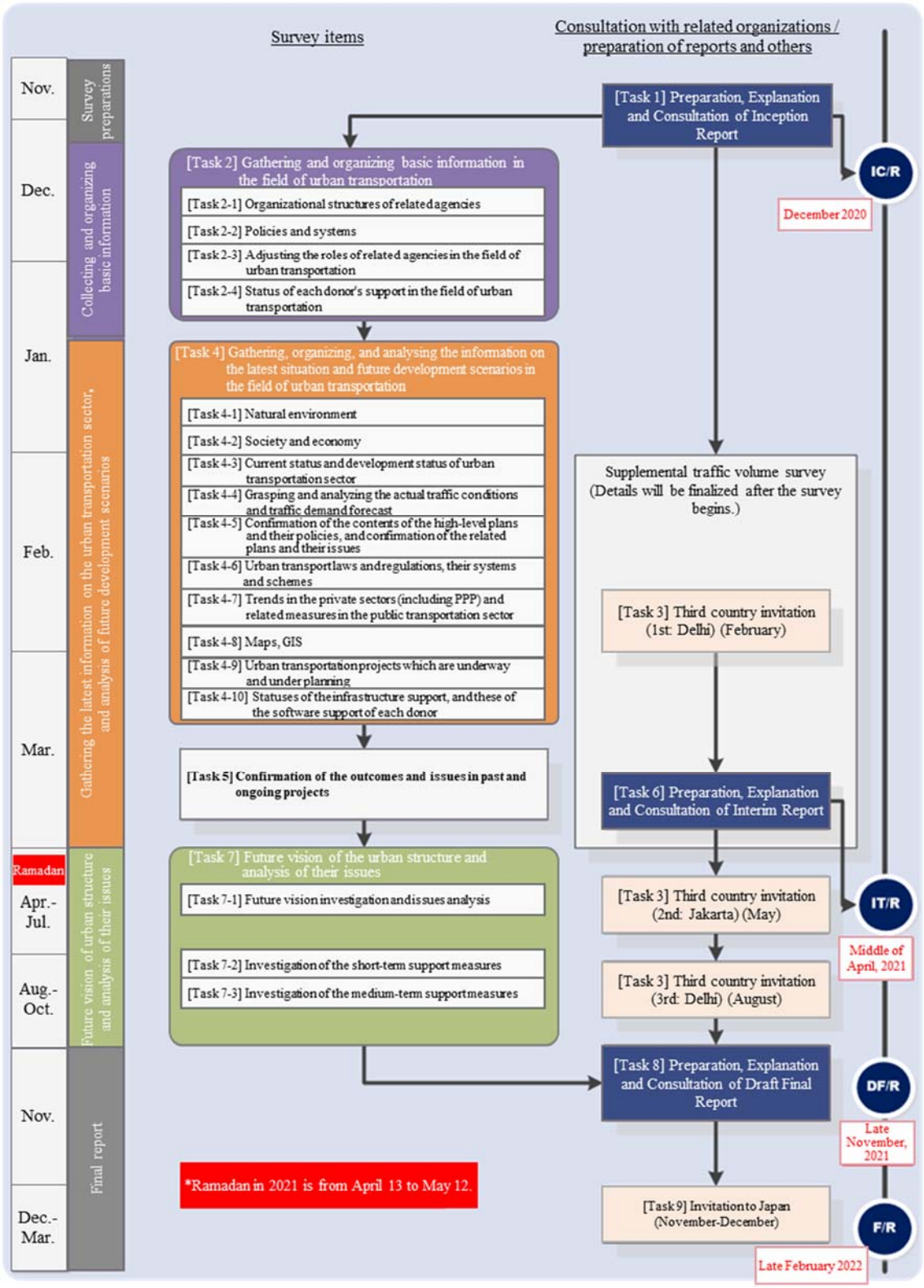


Figure 1.5.1 Flow of the study implementation

1.6 Lessons learned from JICA's previous cooperation with the Afghanistan urban transportation and infrastructure sectors

Table 1.6.1 outlines the main outcomes and challenges as lessons learns from the JICA's previous project.

Table 1.6.1 Summary of outcomes and challenges in previous JICA project

	Tangible aspects	Intangible aspects
Outcome	• The traffic congestion in Kabul is correctly identified as a combined factor of both structural deficiencies in the road network due to topographical conditions and lack of traffic manners. Based on this recognition, we have learnt the project planning techniques and the design techniques focusing on improving intersections that are structural bottlenecks which require time to address. • This project has aimed at improvement of the ability to analyze the causes of traffic congestion and plan countermeasures. From which we have learned the skills how to investigate effectiveness after completion of improvements based on micro-simulation skills and other skills.	• An approach to the technology transfer from a remote location was established in success. • As to the local staff, even personnel who are not familiar with road design and road construction have extensively learned the fundamentals of these technologies.
Remaining issues	• There is a lack of knowledge regarding the desirable future road network development as well as the improvement of existing roads. • The lack of drainage capacity, which is one of the factors causing traffic congestion on city streets during rainy weather, has not yet been addressed. • There are areas where appropriate intersection geometry and traffic treatment is not implemented to accommodate traffic volumes. • The remedial actions to the areas where traffic signals are not working or not operating efficiently have not been yet taken.	• The absolute lack of financial resources is a major constraint, as new road infrastructure development projects require large amounts of money. • The instability of the administrative organization (change of top administrators, frequent reorganization) makes it difficult for technology to be entrenched in the organization. • There are high security issues in general in the society, which are very high restrictions on the activities of the projects.

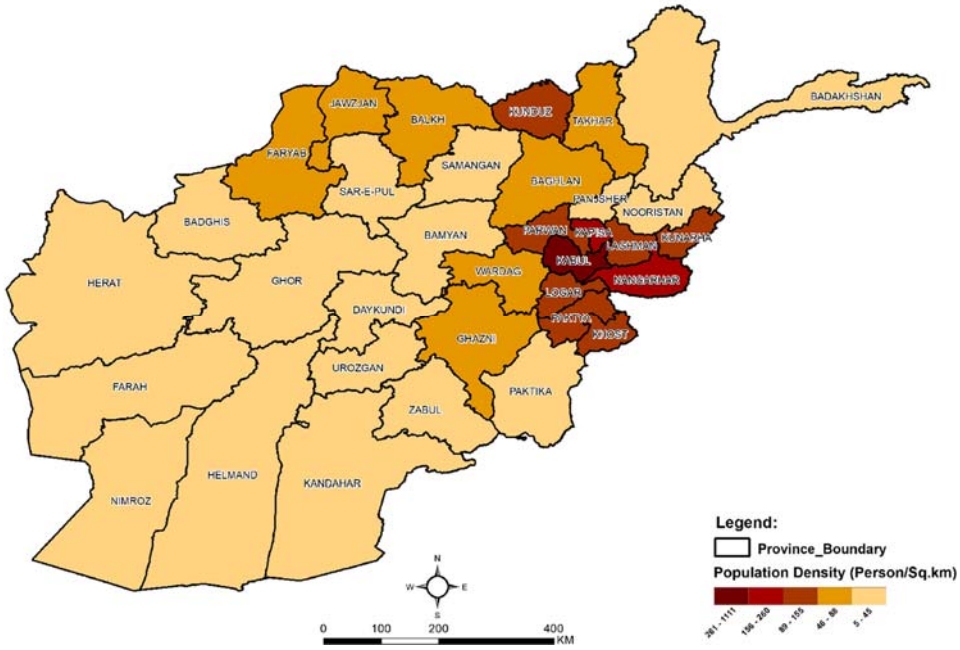
Source: JICA Study Team

Chapter 2 Current socioeconomic conditions of Afghanistan and Kabul

2.1 Socioeconomic condition of Afghanistan and Kabul

2.1.1 Population

In 1399 of Solar Hijri calendar year (2020-2021), Afghanistan had a population of about 32.9 million. Of the total population, about 23.4 million lived in rural areas and about 8 million in urban areas.



Source: National Statistics and Information Authority (NSIA)

Figure 2.1.1 Population density by province (2020-2021)

Meanwhile, the population of Kabul City was about 4.22 million in 2008 when the JICA M/P was established, and the population was expected to reach 4.88 million by 2020 at a growth rate of about 1.2% (between 2008 and 2020).

2.1.2 Economy

While the social infrastructure of Afghanistan had been catastrophically damaged by the conflict that began in 1970s, the average growth rate from 2003 to 2012 reached as high as 9.4% by international support. Between 2015 and 2020, however, the country's annual growth stayed low at 2.5% on average.

Source: The World Bank

Figure 2.1.2 Changes in nominal GDP and GDP growth rate

2.1.3 Industries

When looking at Afghan GDP composition of 2020 by industry, the agricultural industry accounts for 27.1%, the manufacturing industry 12.47%, the service industry 56.07% and the trade industry 4.45%.

2.2 Higher level programs on urban and infrastructure development

Table 2.2.1 Targeted National Urban Transport Plans, Strategies and Prioritized Programs

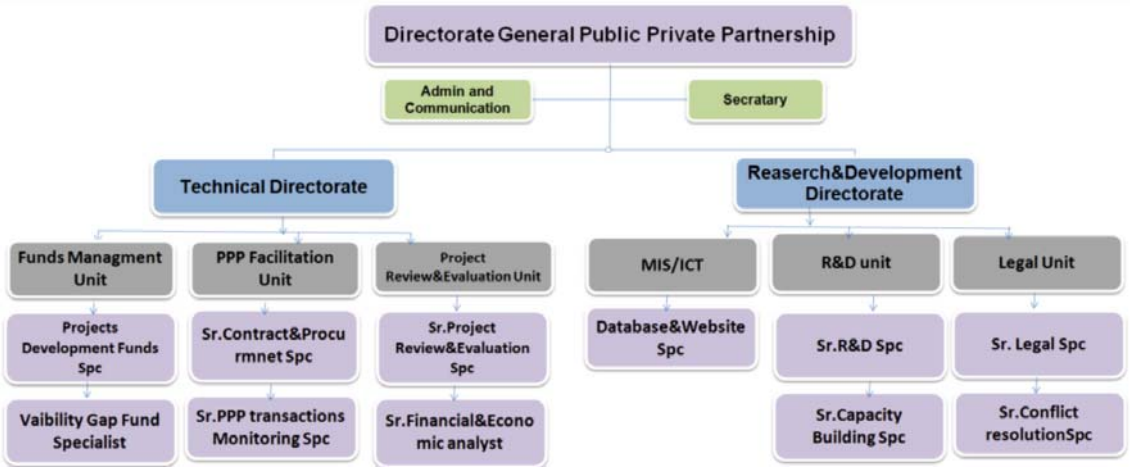
Related Plans, Strategies and Programs	Summary
Afghanistan National Peace and Development Framework (ANPDF, 2017-2021)	Basic policies include: (1) Enhancement of governance; (2) increase in national revenue collection and investment in the economic and social sector; (3) increase in productivity thorough investment in energy infrastructure, promotion of investment in the private sector and urban development; and (4) promotion of women's participation in the development process.
Transport Sector Master Plan (ATSMP 2017-2036)	After having analyzed the status quo and issues of the transport sector, in the Transport Sector Master Plan, it is proposed that the Afghan transport sector needs to transform itself and priority projects need to be set up for subsectors, such as roads, railways, urban transport, airports, promotion of trade and logistics. Specifically with respect to urban transport, it is proposed that the development of Kabul Urban Transport Master Plan should be set up along with projects for the development of BRT and the construction of Kabul Ring Road.
Afghanistan Green Urban Transport Strategy (AGUTS, 2014-2024)	The development of the strategy was led by the Traffic Technology Center of Kabul University and in this strategy, it was proposed that an efficient mechanism should be constructed to offer transport service including urban cargo transport, which is safe, efficient, available at reasonable cost, reliable, friendly to the environment, well planned and concerned about land use as well as to build research quality and capacity.
National Priority Programs (NPPs)	Under the leadership of the Ministry of Finance and based on the development policy established and managed by the interministerial cabinet meeting, NPPs, as priority programs, are established for each sector by relevant ministries and agencies, after the goals were set up by political leaders. According to NPPs, national budgets are compiled so that the ministry in charge can implement such programs. The sectors for which NPPs were established include, infrastructure planning, urban development and other 10 sector programs.
National Infrastructure Development Plans (2016-2025)	As a strategy for the infrastructure sector; (1) Development of regional network plans and improvement of the priority project selection process; (2) sustainable development, cost recovery, financing of maintenance cost and development of maintenance system; (3) promotion of participation of Public Private Partnership (PPP) and the private sector in facilities development and operation/maintenance; (4) increase in orders to be placed to domestic contractors for road construction; and (5) improvement of project management through human resource development.
Urban National Priority Programs (U-NPPs, 2016-2025)	Priority programs are; (1) Improvement of urban governance and system; (2) provision of appropriate houses and basic services to every citizen, and (3) use of urban economy and infrastructure (harnessing). The above pillar (4) has a component, that is, "development of sustainable and well-balanced transport system and infrastructure and provision of related services." Priority in (3); (a) Programs for the public transportation system and investment in BRT, Milliebus, facilities related to bicycles and pedestrians' facilities, LRT, etc.; (b) programs on an international airport in the vicinity of Kabul City (to be developed in 2025 or later); (c) improvement of urban logistics including development of traffic nodes that can support intercity transportation and connect trade routes; (d) integration of transport and land use programs; and (e) promotion of citizens' awareness of transport-related laws, regulations and administration as well as safe, secure and reasonable transportation means for vulnerable users of transportation means, etc.

Source: Prepared by the Study Team based on related plan documents. Underlined parts are policies related to urban programs, urban development, and transport and traffic sector.

2.3 Investment by the private sector

2.3.1 Summary of PPP system

Since 2014, the Ministry of Finance has been making efforts to develop schemes to implement PPPs for development of infrastructure, etc. And later in 2016, when the PPP Law was enacted, the Central Partnership Authority (CPA), an organization to administer PPPs, was set up.



Source: Central Partnership Authority (CPA), Ministry of Finance Afghanistan

Figure 2.3.1 Organizational structure of CPA

2.3.2 The role of CPA

- To establish standardized forms, rules and various guidelines with an aim at implementing PPPs smoothly in public-private partnership according to the PPP Law
- To establish a method to review the proposed PPP and standards for that purpose, to offer advise to the Economic Committee, to prioritize projects and to develop action plans up to the point of project implementation
- To carry out actual reviews on the proposed PPP (strategy, economic impact, financial conditions, value for money, risk management, lawfulness and due consideration for the environment and the society) and to organize a process to hear from concerned organizations and stakeholders including the Economic Committee
- To implement preparation and registration processes necessary for administrating the PPP
- To coordinate with concerned organizations and receive advice
- To offer technical support to the PPP owner after the project is approved, including how to establish a specified company
- To review the evaluation made on feasibility study, bidding documents, contracts, etc.
- To offer advice to organizations participating in the PPP or on how to enhance relationship of relevant companies
- To manage matters related to fund procurement for the PPP
- To develop policies for the use of IT in the PPP and to carry out necessary works (such as compilation of database)
- To build up the capacity for specified areas related to the PPP and to develop relevant training programs
- To prepare annual reports to present information on the PPP in an organized way
- To carry out monitoring processes of bidding management and implementation contract
- To carry out other necessary and relevant activities

Chapter 3 The current urban transportation situation in the Kabul Metropolitan Area

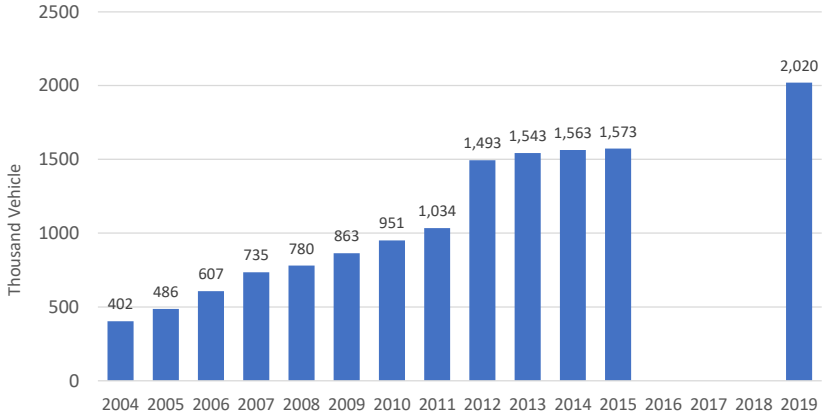
3.1 Definition of Kabul Metropolitan Area

In 2016, when JICA was studying the new Dehsabz-Barikab urban development plan, the principal entity that was to implement the development, the Dehsabz-Barikab City Development Authority (DCDA), was reorganized as the Capital Region Independent Development Authority (CRIDA). As such, CRIDA was defined as the organization with jurisdiction over development in that region.

3.2 Urban transportation situation and status of maintenance in the Kabul Metropolitan Area

Number of registered vehicles

The number of registered vehicles reached 5 times during 15 years since 2004 with an average increase of 11.4% per year.

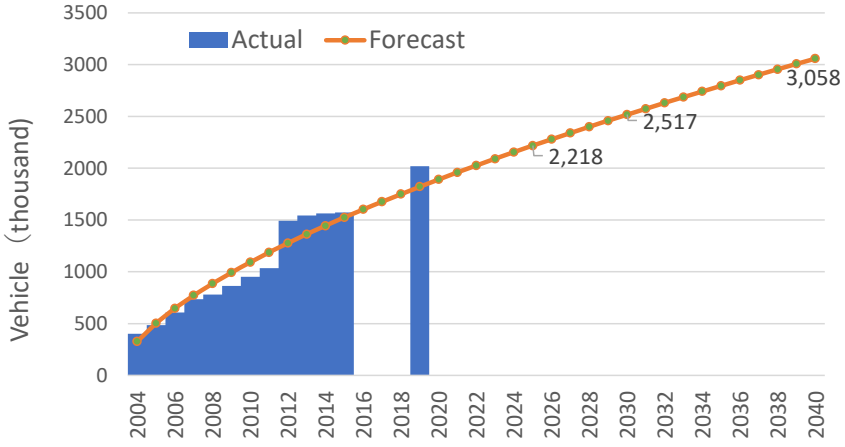


Source: Afghanistan Statistical Yearbook

Figure 3.2.1 Changes in the number of registered vehicles in Afghanistan

3.2.1 Projected numbers of registered vehicles

A simple projection of the current trend indicates that approximately 2.2 million vehicles will be in use in 2025, 2.5 million in 2030, and 3.0 million in 2040.

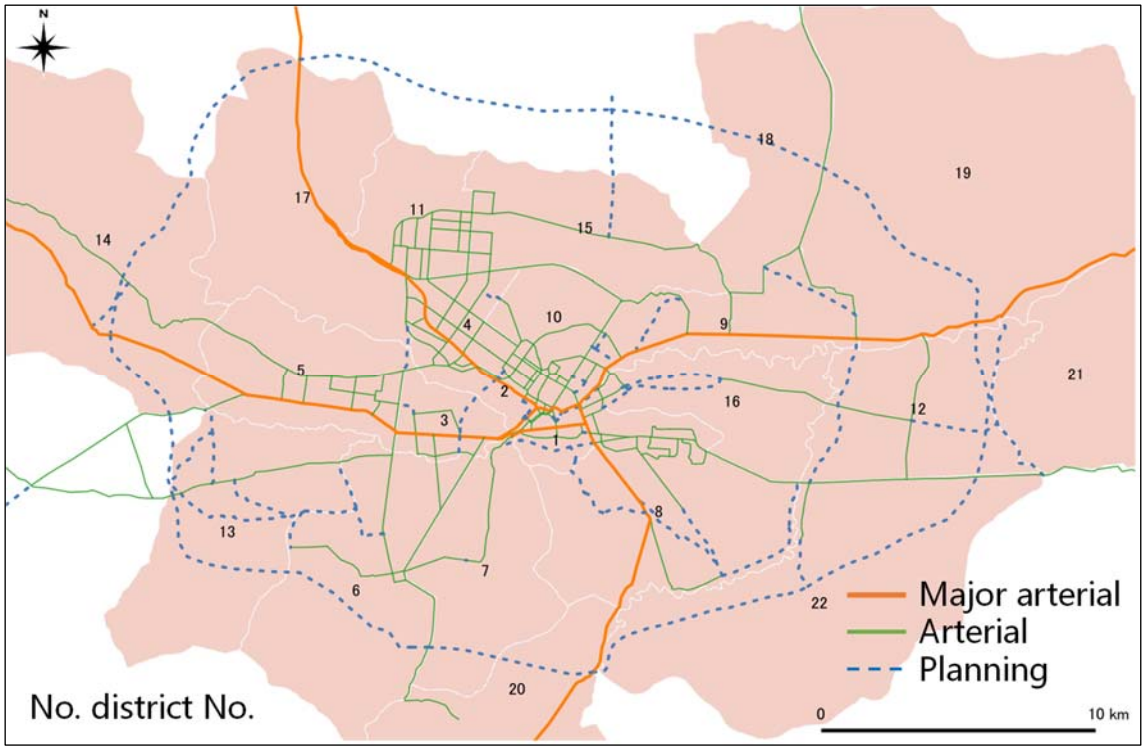


Source: Prepared by the Study Team

Figure 3.2.2 Forecast of number of registered vehicles in Afghanistan

3.2.2 Status of road network in Kabul Municipality

The trunk roads in the city are categorized as major arterial roads and arterial roads, extending 105 km and 402 km, respectively, making 507 km in total. An additional road network of about 188 km is planned, most of which will be the Kabul Outer Ring Road.



Source: JICA Study Team

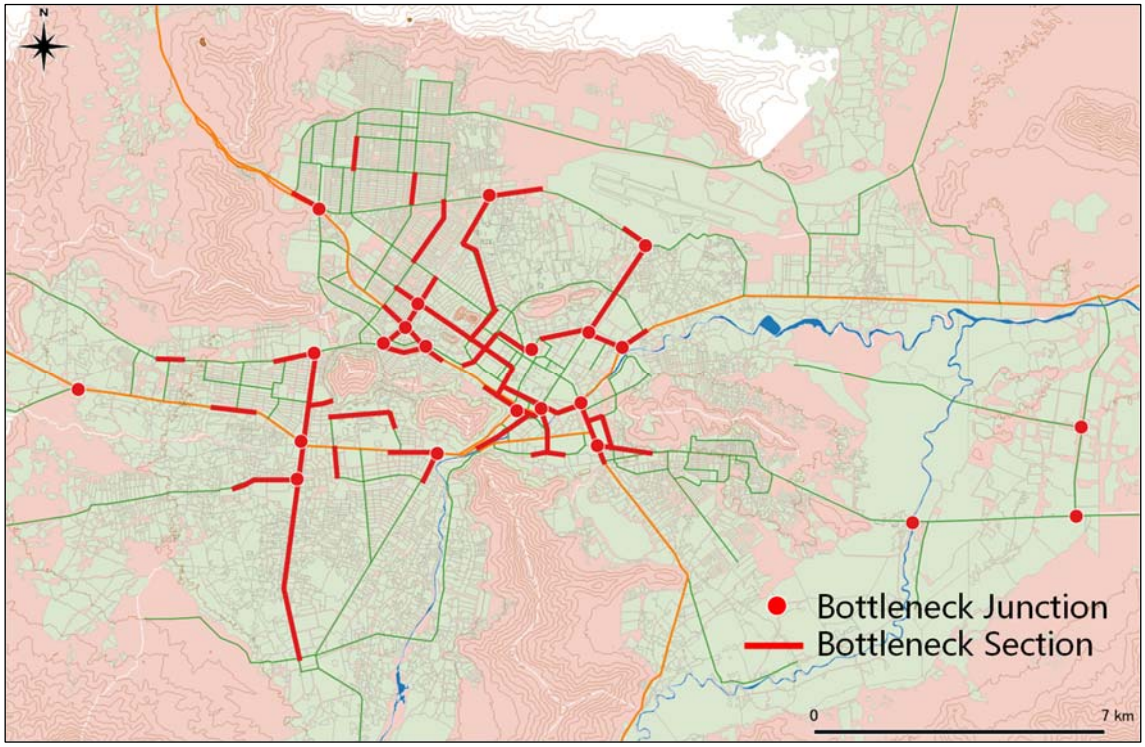
Figure 3.2.3 Road network in Kabul Municipality

3.2.3 Road traffic situation

In this study, a survey on the actual traffic condition was conducted at three locations on trunk roads inside Kabul City, and at six locations on roads at the boundaries with suburbs. Actually, traffic beyond capacity of roads is observed in many arterial roads in Kabul City.

3.2.4 Major bottlenecks

Twenty bottleneck sections were identified at intersections in Kabul City, with traffic jam occurrences, extending over 50 km of the city roads. The length of bottlenecks in the city road network accounts for about 12% of the total length of the network.



Source: JICA Study Team based on hearing for Kabul Municipality

Figure 3.2.4 Locations of bottlenecks on roads in Kabul Municipality

3.3 Status of public transportation

3.3.1 Summary

Public transportation service in Afghanistan is mainly provided by buses. while a BRT project has been consideration to improve the public transportation issues in Kabul City, the project is not progressed well.

3.3.2 Public transportation situation

The Milli Bus Enterprise was established as a national bus service fifty years ago to handle all bus services. Issues of Milli Bus faces as a public company include limited stock of vehicles and depots it owns. There are also problems related to company management's jurisdiction. All this has resulted in the company failing to provide services that fully meet citizens' needs.

For this reason, in addition to Milli Bus Enterprise, a number of private bus companies are now in operation, some are legally established, and some are not.

3.3.3 Management by national bus operator

It has been insufficient organizational structure of the Milli Bus enterprise and maintenance and operation are not appropriate under some of issues, e.g. lack of staffs' capacity and corruption.

3.3.4 The operating system

The old-style management system used at Milli Bus Enterprise remains unchanged, and the monitoring of bus operations is ineffective. The service management system is far from the ones that could ensure that buses run on time according to a schedule. In Kabul, in particular, there are no fixed bus stops, and every day passengers get on and off the buses wherever they request, which leads to a user's defection.

3.3.5 The financial situation

For the sake of financial stability in a bus business, it is very important to have a clear understanding of the balance between revenue from fare collections and operating and maintenance costs. To achieve financial stability and operating efficiency, in recent years cities throughout the world have used information technology to upgrade systems used to monitor fare collections and operating and maintenance costs. Milli Bus continues to use a truly old, outmoded system — one in which business payments are made in daily installments.

3.3.6 Private bus operators and taxis

As indicated above, when public transportation services provided by the government are insufficient, private bus operators play an important role. According to Afghanistan's Transport Ministry, seventeen private bus operators and their combinations are operating in Kabul City, with approximately 2,500 buses (mainly mini-buses or small-scale buses equivalent in size). In addition, there are seven private taxi businesses operating approximately 4,100 registered vehicles. In the private bus business, aside from individual operators, operating conditions are very difficult. Life-Star Company and Kabul-Cab are examples of companies that have left the business to concentrate on taxi operations.

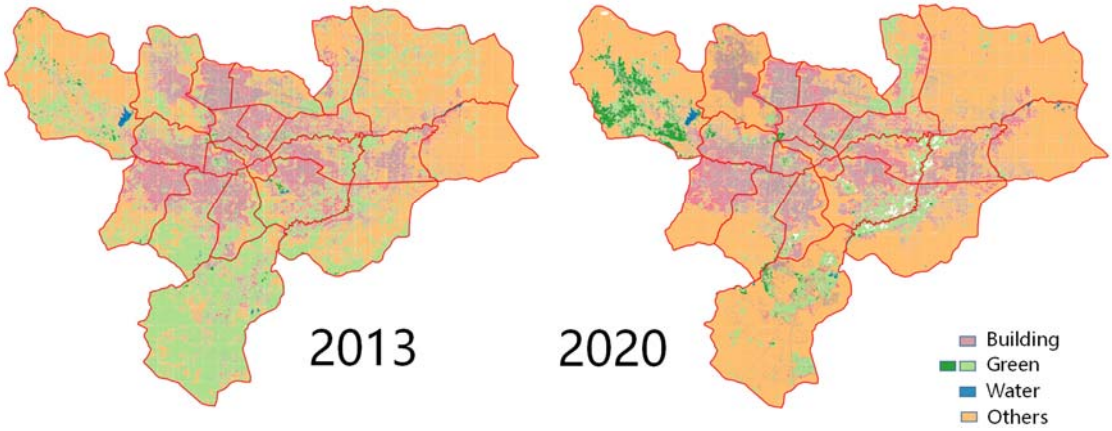
According to a technical director of the public bus company, the systems and organizations providing support for private bus operators in Kabul City are insufficient, and surviving in this operating environment is very difficult. In addition, passenger cars are used for jitney-type taxi operations in the city.

The following types of operation and management issues pertain to private buses and taxis and their combinations:

- No sense of unity in private bus operations
- Insufficient regulation of private bus management and operation; no plan for operating lines
- Insufficient parking spaces for buses in Kabul City
- Lack of clarity in government contracts and government authorizations for private bus operations
- Lack of system for regular reports from private operators
- Gap between the rising cost of operating, and management and maintenance and decreasing revenue from fares
- Lack of clarity in definition of roles and burdens to be borne by government bus operations and private bus operations
- As a public transport service, unreliability and low operating efficiency of vehicles (in terms of form and capacity)

3.4 Urban sprawl condition

Due to drastic population increase in Kabul City, urban area has been expanded and land use is also changed.



Source: JICA Study Team

Figure 3.4.1 Urban expansion in Kabul Municipality

3.5 Master Plan related to transportation in Kabul Metropolitan Area

There are two master plans including transport infrastructure development in Kabul City, namely, JICA M/P supported by JICA and KUDF implemented by MUDL.

Table 3.5.1 Comparison of contents of JICA M/P and KUDF

Items		JICAMP	KUDF
Outline	When created	2011	2018
	Area covered	Existing urban districts (all 22 districts)	Existing urban districts (all 22 districts)
	Plan level	Outline design (drawings and quantities)	Landscape design
	Survey of actual traffic situation	Conduct home visits and survey of transportation	Almost nothing implemented (other report utilized)
	Cost estimates	Implemented	Almost none

Source: JICA Study Team

There are also two major studies for BRT development in Kabul.

Table 3.5.2 Comparison of results between KUDF and BRT M/P

BRT M/P	KUDF
7 lines (1 line without exclusive tracks; total length 221 km)	7 lines, total length 214 km
Construction period: 2025 - 2030	Not specifically stated; until about 2028
User demand: 930,000 per day in 2030 (total for 7 lines)	User demand: 400,000 – 500,000/day by around 2028 (max. number of lines)
Route drawings are nearly the same (some parts differ)	

Source: BRT M/P and KUDF

3.6 On-going/planned urban transportation projects in Kabul Metropolitan Area

The table below shows projects under-way or being planned in the Kabul Metropolitan Area.

Table 3.6.1 On-going or planned transportation projects in Kabul

Type of work	Implementing entities		Project name, contents
Implement project;		Public Transport Directorate	・ Pedestrian bridge construction（10 bridges (in 2020); 25 bridges (planned for 2021)

provide materials, equipment	K M		・ Interlocking pedestrian facilities (38,000 km^2 : public notices) bicycle path construction (planned for 2021) ・ Bus stop construction (264 locations), nearly completed
		Infrastructure Directorate	・ Construction of community roads (Districts 12,13,16 - 18,20,22; total length 30 km planned) ・ Flyover construction (Sarai Shamali; planned)
		Traffic Affair Coordination Directorate	・ Improvement of intersections, from roundabouts to intersections with signals (Part to be done as KUTEI) (See W/B below)
	MOT (for Indian government)		・ Provision of spare parts for buses (enough for 350 buses; 50% delivered); Provision of buses (being planned)
	CRIDA		・ Road construction in Kabul and outer areas under its jurisdiction (in progress, or planned)
Technical cooperation	Japan International Cooperation Agency (JICA)		・ Technical Cooperation Project for Road Management (completed in 2021) ・ Land, District Reallocation Project, Technical Cooperation Project for City Redevelopment (Planned)
	World Bank (W/B)		・ KUTEI (Kabul Urban Transport Efficiency Improvement Project) and Phase-2

Source: JICA Study team based on hearings with Kabul Municipality and Milli Bus Enterprise

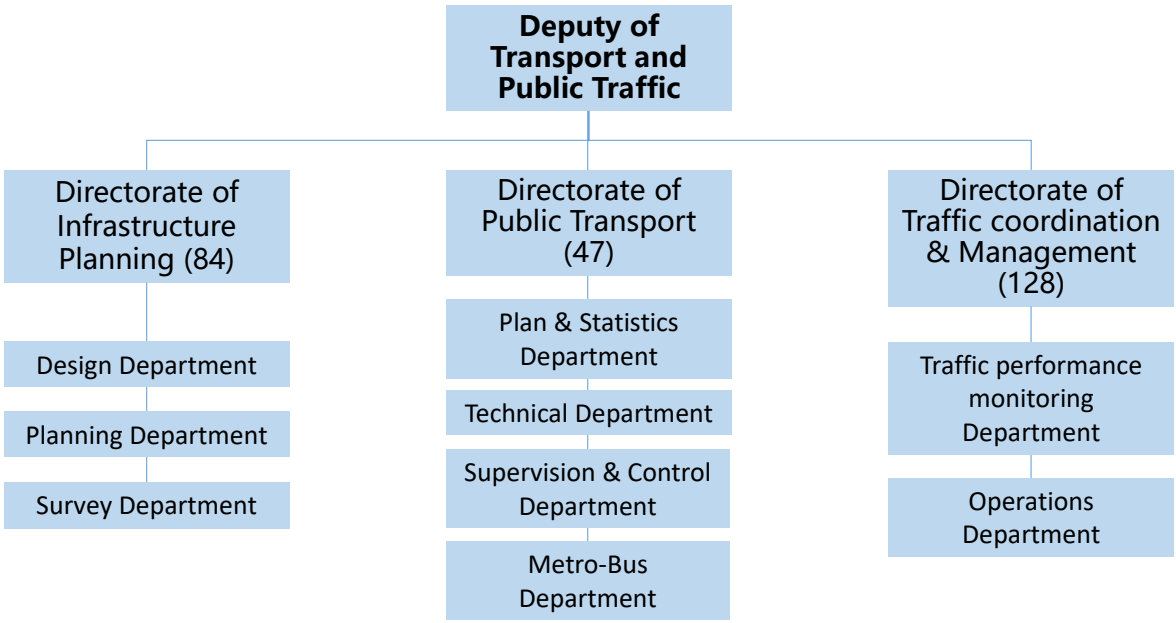
3.7 Ministries/Agencies in charge of policy making and implementation in urban transportation sector for Kabul Metropolitan Area

3.7.1 Summary of related organizations

The related organizations are in Kabul City, and they have a Vice Mayor in charge of transportation. Three departments work under the Vice Mayor in this sector: the Infrastructure Planning Department, the Public Transportation Department, and the Transportation Management Department. The staff for these departments, including transportation control officers and bus drivers, has grown to about 250 persons.

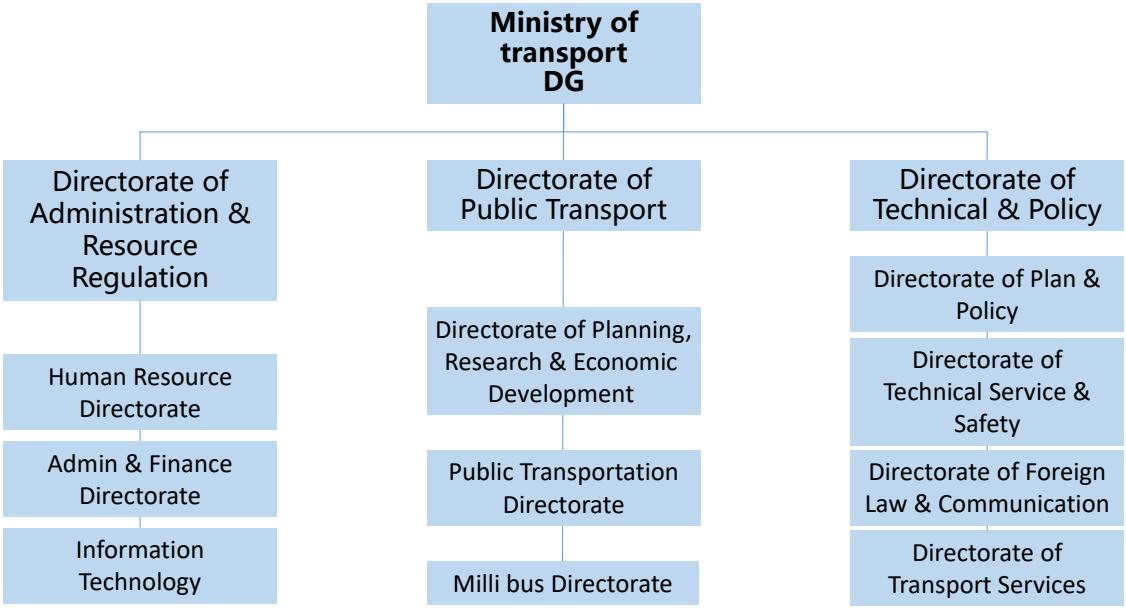
3.7.2 Organization charts

The charts shown below show the interrelationships of the organizations involved.



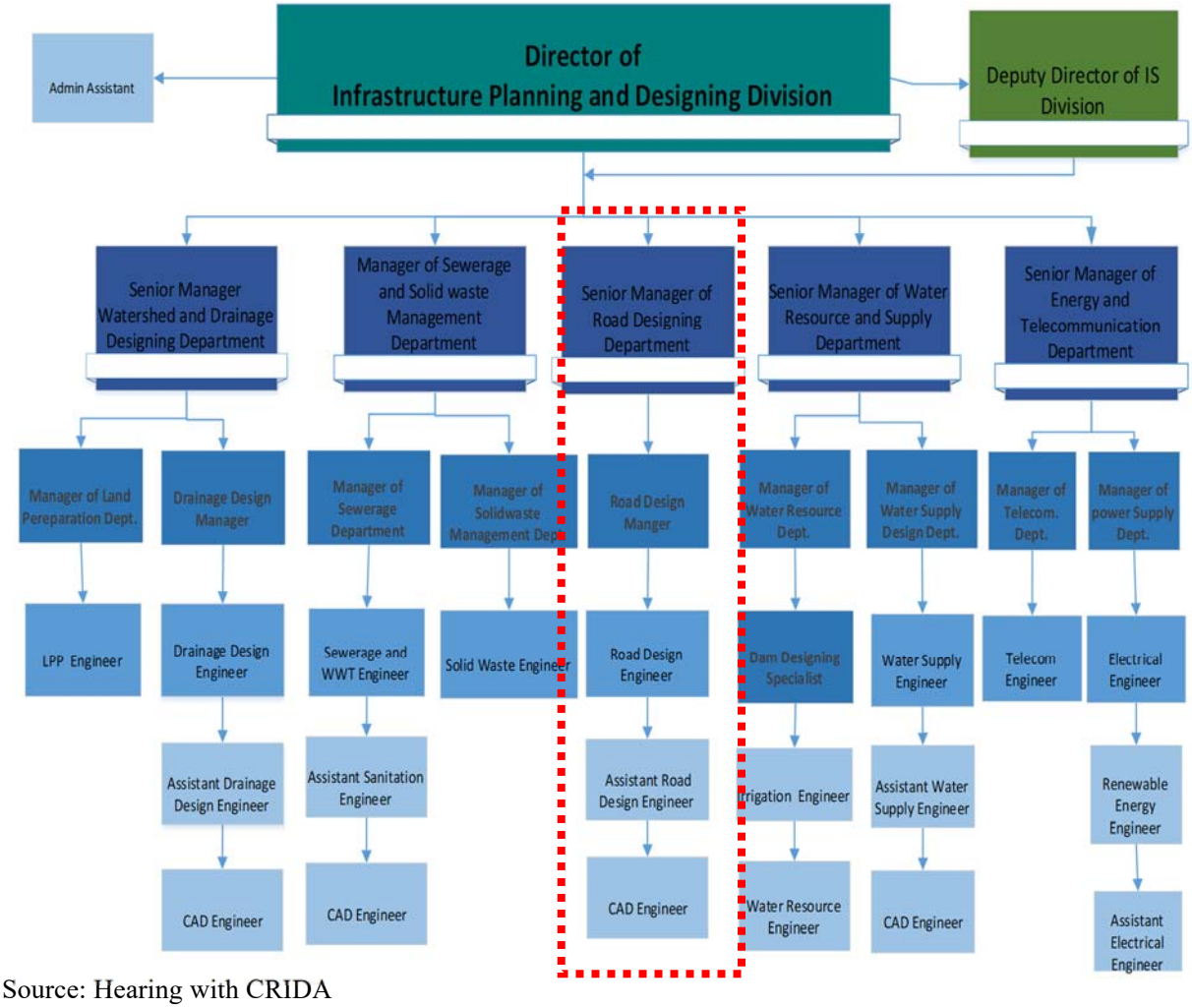
Source: JICA Study Team based on hearing with Kabul Municipality

Figure 3.7.1 Organizational system for the administration of urban transportation in Kabul



Source: JICA Study team based on hearing with Ministry of Transport

Figure 3.7.2 Organizational system for the administration of urban transportation under the Afghanistan Ministry of Transport



Source: Hearing with CRIDA

Figure 3.7.3 Organizational system for the administration of urban transportation under CRIDA

3.8 Cooperation in urban transportation sector from other donors

Among the main donors providing assistance to Afghanistan along with the World Bank (W/B) and the Asian Development Bank (ADB) are the EU and the United States (USAID). The W/B is Afghanistan's biggest donor in the transportation field. Others providing assistance include the Afghanistan Reconstruction Trust Fund (ARTF), the International Finance Corporation (IFC), and the International Development Association (IDA). The ADB also provides aid through the Asian Development Fund (ADF). Other forms of T/A and loans are also received. The ADB also provides assistance in drafting of the Transportation Master Plan. EU assistance is centered on cooperation in the social sector, particularly in the railway field. USAID provides significant cooperation in renovation of the transportation sector, primarily in highway construction.

Chapter 4 Field traffic survey and summary of traffic demand analysis

4.1 Review of transportation studies and field traffic surveys in past

The results of major studies on the transportation situation in the Kabul Metropolitan Area are included in the JICA M/P (2009), UN-HABITAT (2016), and the BRT M/P (2018).

Table 4.1.1 Summary of field traffic surveys in transportation studies

Study	Transportation situation	Demand projections	Notes
JICA M/P	・PT survey (5,000 households) ・Cordon line traffic volume survey (6 points) ・Screen line traffic volume survey (3 points)	・Target year: 2025 ・OD table for each purpose, each method ・Volume of road traffic	Transportation situation as of August 2008
BRT M/P	・Road traffic volume (26 points) ・Intersection traffic volume (25 points) ・Roadside OD survey (32 points) ・Bus terminal survey (10 points) ・Traveling speed survey (6 points)	・Target year: 2030 ・Volume of road traffic (AM peak) ・BRT transportation volume (PPHD)	Transportation situation as of December 2017
UN-HABITAT	・Cordon line traffic volume survey (6 points)	—	As of February 2016

Source: JICA Study Team

4.2 Outline of additional field traffic survey and results

4.2.1 Types of traffic surveys

The traffic surveys were conducted to update the data needed to analyze transportation demand analysis.

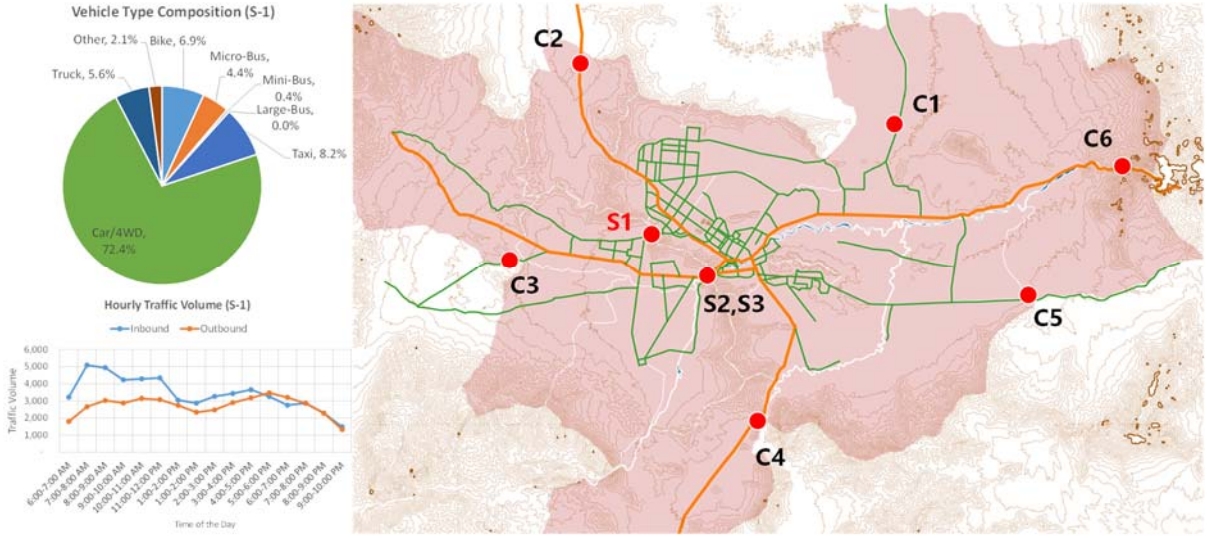
Table 4.2.1 Contents of traffic survey

Survey items	Purpose of survey	Outline of survey
Screen line traffic volume survey; Cordon line traffic volume survey	To update OD table showing persons and conditions in 2008 created for JICA M/P; to create an OD table for 2020 based on persons and current situation.	After making a video recording for each direction, traffic volumes were tabulated by analyzing video images; volumes for vehicle types and for each time frame were determined.
Person trip flows	To supplement person-based OD table created for JICA M/P in 2008; created to grasp most recent flow patterns in districts with sharp increase of population.	Individual cell phone location information was tabulated as big data; data on movements (flow) of people was organized.

SP interview survey	Conducted to estimate conversion of transportation to BRT whose introduction was being planned.	A questionnaire survey via cell phones or the Web was conducted; survey results were tabulated and analyzed to create a model for each means of transportation's share in moving people.

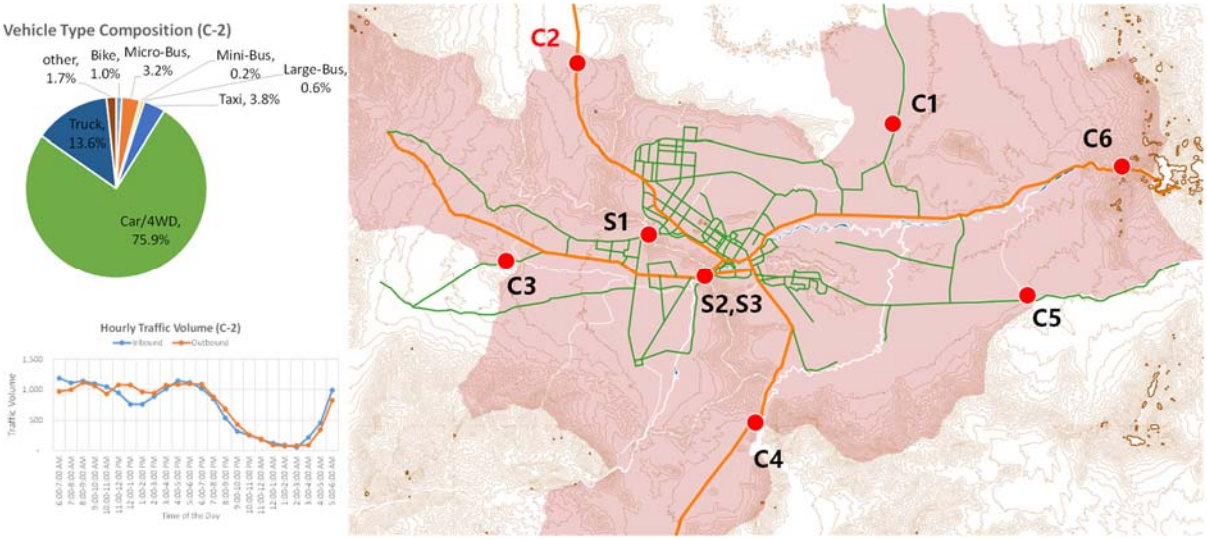
Source: JICA Study Team

4.2.2 Cordon line survey and screen line survey



Source: JICA Study Team

Figure 4.2.1 Results of screen line survey of traffic flow at 24-hour observation point (S1)



Source: Prepared by Study Team

Figure 4.2.2 Results of cordon line survey of traffic flow at 24-hour observation point (C2)

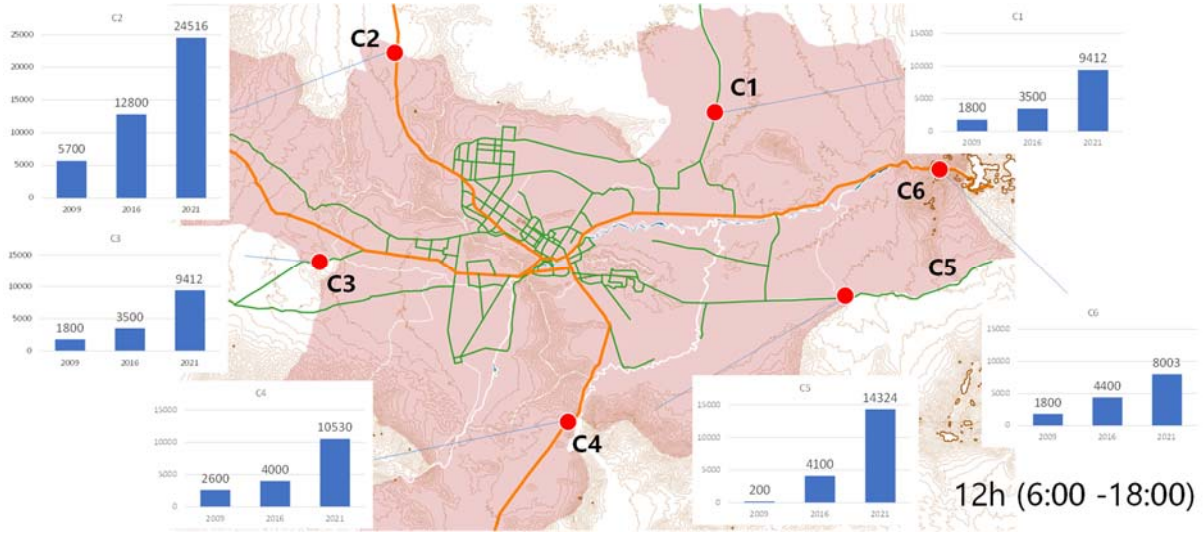
4.2.3 Numbers of public transportation users

According to traffic surveys results, the numbers of people crossing the cordon line is about 350,000 per day, of which seventy-five percent of the trips covered by private modes and the remaining were covered by public transportation. On the other hand, people crossing screen line, which is volume crossing between east side and west side in the city, is about 710,000 per day, of which 64% covered by private modes and the remaining covered by public transportation.

4.2.4 Roadside OD interview survey

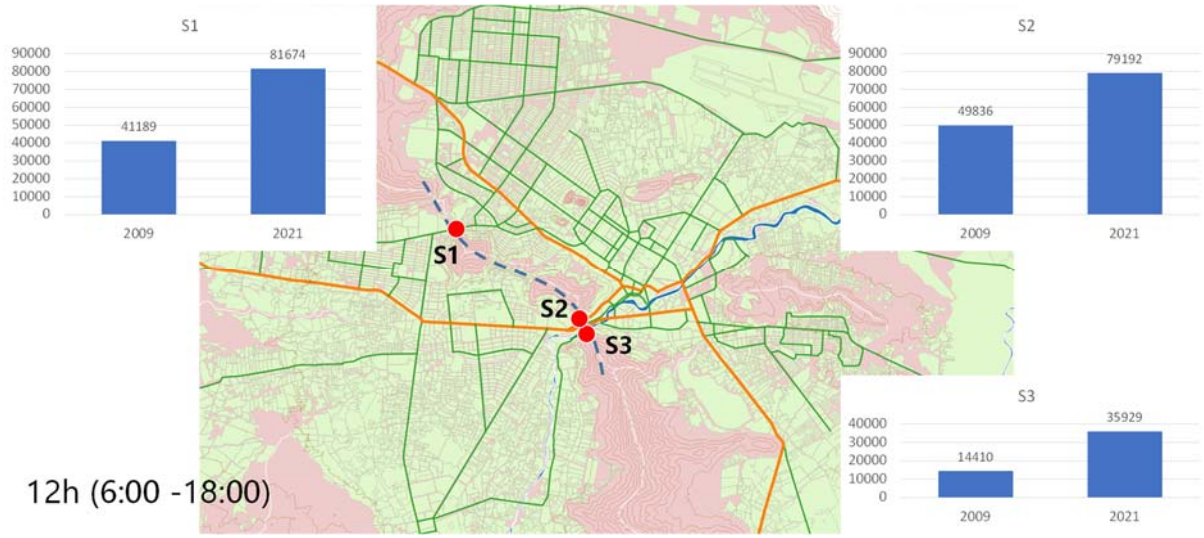
In the cordon line and the screen line surveys, along with recording the flow of traffic passing each observation point, driver interviews were conducted to understand the origins and destinations of each trip. The interview surveys were done for 16 hours, from 0600 to 2200.

4.2.5 Analysis of fluctuation of traffic volumes



Source: JICA Study Team

Figure 4.2.3 Changes in traffic volumes observed in cordon line survey



Source: JICA Study Team

Figure 4.2.4 Changes in traffic volumes observed in screen line survey

4.3 Analysis of person trips flow using mobile phone big data

Figure 4.3.1 provides an example of late-night image data showing users' locations.

Source: JICA Study Team

Figure 4.3.1 Active location data in night (01:00–04:00)

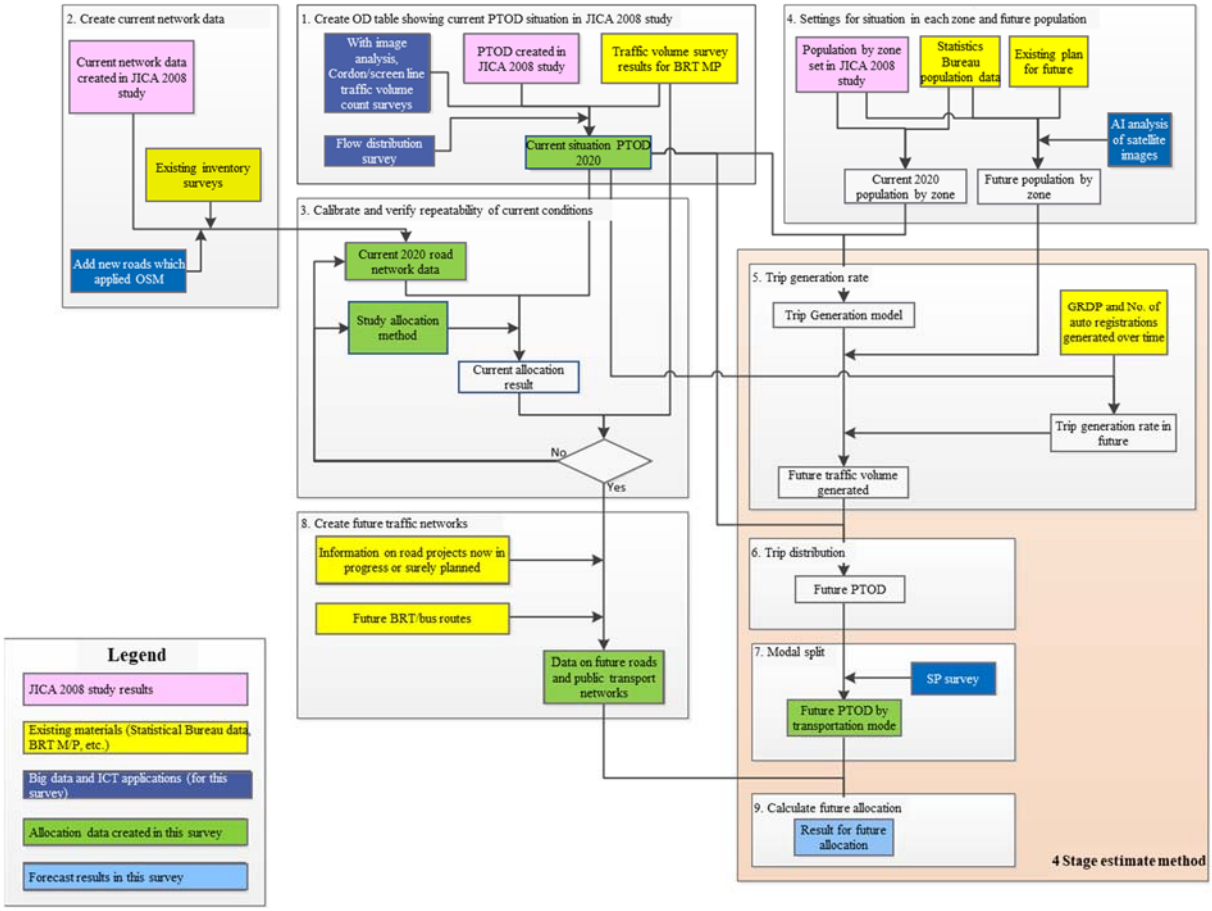
Source: JICA Study Team

Figure 4.3.2 Active location data in daytime（9:00–12:00）

4.4 Transportation demand analysis

Flow of traffic demand analysis

OD table and road network of JICA M/P were updated based on latest population and traffic data. The targeted years is in 2025 as a short term, 2030 as a medium-term and 2040 as a long-term.

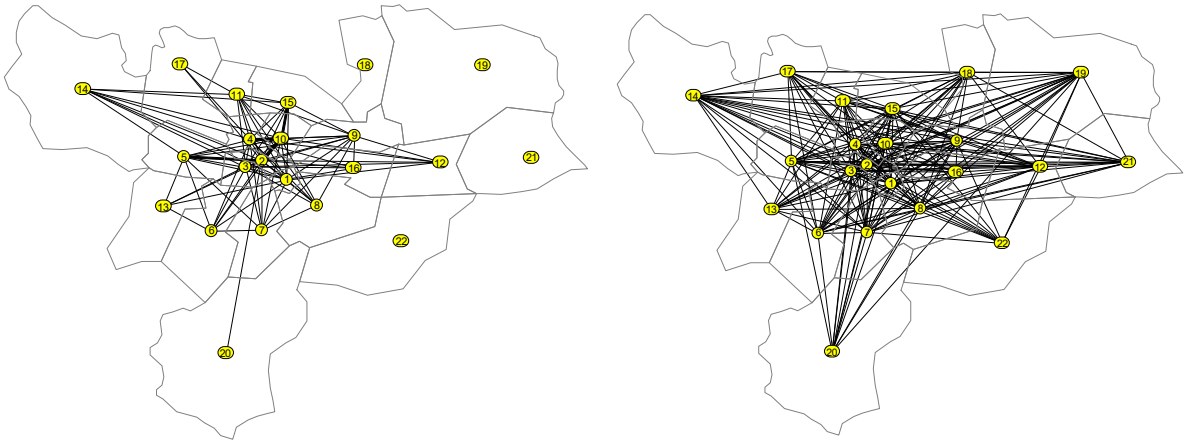


Source: JICA Study Team

Figure 4.4.1 Flow of demand forecasts

Revised current road network and OD table

The road network prepared in the 2008 in JICA M/P is almost same condition in Kabul. The revised current OD table as of 2021 was updated based on the previous current OD table in 2008 to match the results of the cordon line survey and screen line survey conducted in this study.



Source: JICA Study Team

Figure 4.4.2 Change of trip generation/attraction by zones

4.5 Future framework and forecast of OD table

4.5.1 Future urban development scenarios

Three alternatives of development policy are considered as urban development scenarios.

Table 4.5.1 3-Urban development scenarios

Scenarios	Outline	Employment location
Trend type	Current development pattern will be continue, i.e. population growth and urban area will be expanded according to the trend	No any major changes of employment locations from current situation
High density in CBD type	Assuming the high density development as same as most crowded district 10 level in the central area, i.e. zones (1 to 11, 13, 15, 16), according to the BRT and relevant development along the corridors.	It is assumed that employee in the central area will be increased according to high density development in there.
Suburban allocation type	New development will be progressed according to the open area capacity	No any major changes of employment locations from current situation

Source: JICA Study Team

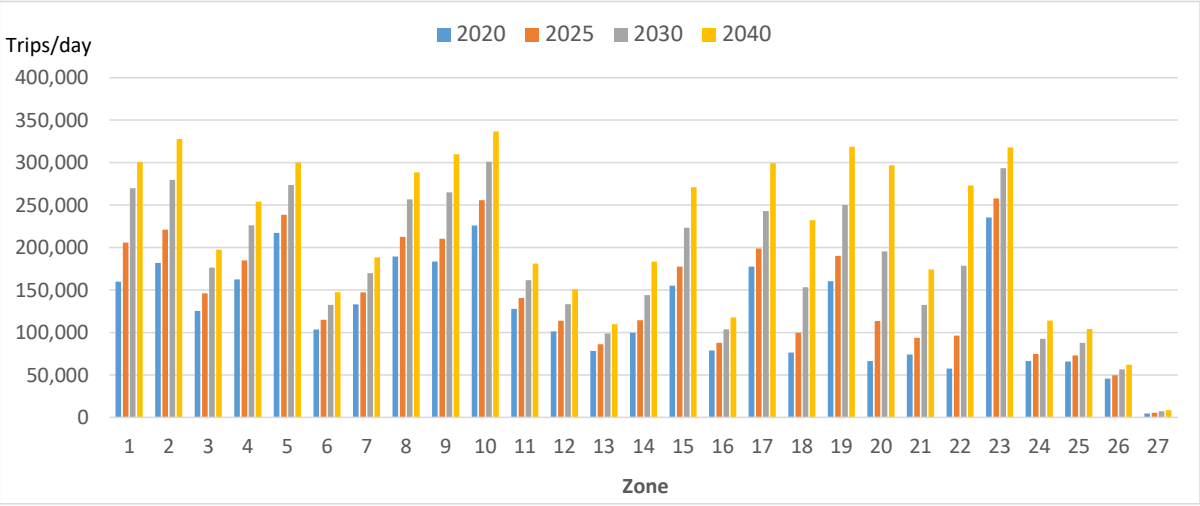
Table 4.5.2 Comparison among urban development scenarios

Scenario	Trend		High density in CBD		Suburban allocation	
Year	CBD	Suburban	CBD	Suburban	CBD	Suburban
2020	72%	28%	72%	28%	72%	28%
2025	70%	30%	71%	29%	69%	31%
2030	65%	35%	68%	32%	62%	38%
2040	59%	41%	65%	35%	57%	43%

Source: JICA Study Team

4.5.2 Forecast of future OD table

Based on the future framework of trend type urban development scenario, future OD tables of 2025, 2030, and 2040 were estimated.



Source: JICA Study Team

Figure 4.5.1 Change of trip generation/attraction by zones by year (trend type)

Chapter 5 Challenges on urban transportation sector in Kabul Metropolitan Area and direction to improve

5.1 Challenges on urban transport sector

5.1.1 Challenges on road network and transportation infrastructure

Since road network in Kabul City radiate outward from the center of the city and many of missing links are found due to geographical constraints, the traffic to be run through the city from north to south or from east to west is imposed to pass in the central district which is major reason of heavy traffic congestion.

5.1.2 Challenges on public transportation services

Public bus service in the city was once (over thirty years ago) comprised of 54 lines by approximately 1,000 vehicles. By 2008, the number of buses had shrunk to about 360, with no more than 100 buses running on four of the main roads extending from the central district. Current data indicates that this number has further decreased. Thus, weakening of transport capacity is a serious problem. It is also pointed out that services are also plagued with various problems including poorly maintained vehicles, lack of schedules, and absence of punctuality. The transportation capacity of the public buses is insufficient, and coordination with private buses (provided mostly by individual operators) is necessary, but the vehicles run by private operators are in worse condition than the public buses are. Private buses are generally small in size, which means they are low in efficiency and add to environmental problems. The lack of clarity in the allocation of roles played by public and private buses is another issue.

5.1.3 Challenges on traffic management

Several external factors contribute to the large drop in basic transportation capacity of road infrastructure in Kabul City. Drivers cut into lines of traffic moving through intersections; others drive against the flow of traffic. Disorderly, careless driving and illegal parking along roads are among the other problems. Jaywalking, in which cars and pedestrians are entangled, is everywhere and is another issue. Poor traffic manners and lack of education are viewed as causes of such problems, which combined with geometric and structural factors, have led to the city's chaotic traffic situation.

Further complications arise from electric power failures, broken traffic signal equipment at many intersections, and confusing rules regarding one-way streets.

5.1.4 Challenges on organizations and institutions

A new department has been created in Kabul City for the transportation planning, but it is said that it is staffed by a younger generation with only a few years of experience. This leads to lack in knowledge and capabilities that come with actual work experience. Large numbers of non-technical personnel (such as transportation supervisors) have been hired or are registered to be hired, but positions where they can show their capabilities have not been secured. This has been pointed out as a confusion that arises when a new organization is launched.

In a situation in which problems with manners and rules pertaining to auto traffic and pedestrians lead to frequent traffic jams, strengthening traffic management and control is the responsibility of traffic police. A major problem is that this primary function continues to be neglected. Previously it was performed by Kabul City and the Interior Ministry in an arrangement in which administrative jurisdictions were vague. As a result of discussions between the two entities, a temporary agreement was reached to put all Kabul City's traffic police in charge. However, according to local staff, the system has reverted to administration by both organizations, and the management situation continues to be unclear.

5.2 Needs for improving urban transportation system

The followings are the most pressing improvement needs for urban transport sector as short-term;

- Revision of the JICA M/P (revise for coordination with the KUDF)
- Improvement of facilities at intersections to eliminate traffic bottlenecks (together with widening, other redevelopment work in blocks along the roads)
- Training and development of personnel in departments concerned with urban transportation planning
- Education and reassignments of the approximately 300 non-technical personnel in transportation supervisory positions, etc. (for effective utilization of human resources).

Similarly, the followings are improvement need for the sector as medium-term;

- Support for the early introduction of public transportation (BRT) (with eastern district of Kabul City as a priority)
- Support for provision of ring roads (belt line highways)
- Elimination of traffic bottlenecks (at bridges and intersections)
- Fill in the gaps in roads to eliminate missing links
- Support for traffic (transportation) safety improvements.

It is global shifting to smart operation with the use of digital technology and ICT around the world. Under the situation that development of road infrastructure is difficult, it is much serious challenge to ensure road capacity effectively according to design volume.

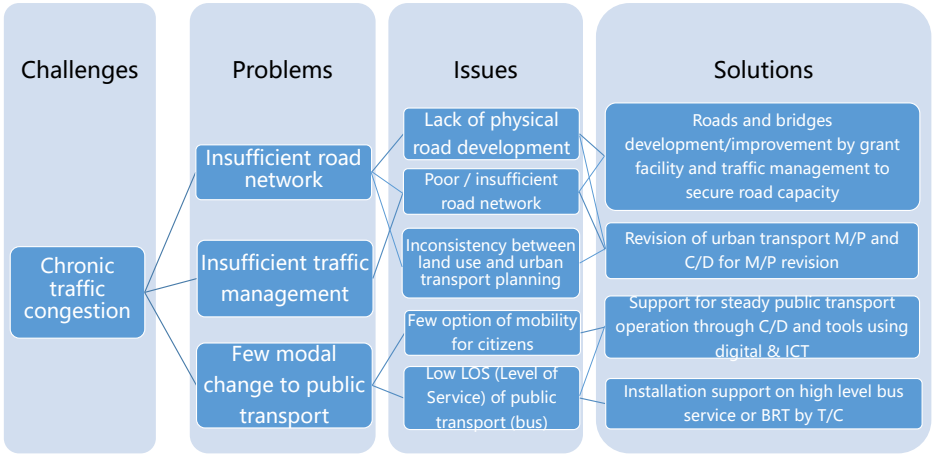
5.3 Coordination with JICA's support policy

The JICA support plan for Afghanistan, which proposes futuristic technologies in the urban transportation field, offers the following three features:

- It is designed to eliminate bottlenecks and make inner-city traffic run smoothly
- It proposes a modal shift to public transportation
- It is designed to improve road networks in the country's urban areas.

5.4 Direction and framework of JICA's support to improve urban transportation system

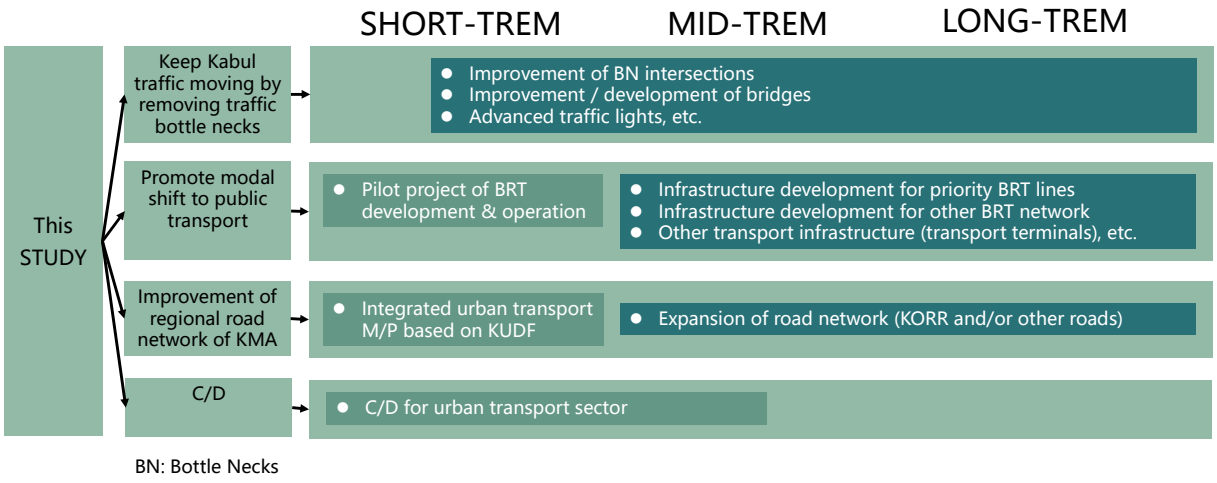
The flow of measures proposed to solve the issues of traffic congestion in Kabul are set forth below.



Source: Prepared by the Study Team

Figure 5.4.1 Policy of JICA's support for improving urban transport sector

A support concept with a time frame and in line with the JICA's three objectives proposed for the field of urban transportation is presented below.



Source: JICA Study Team

Figure 5.4.2 Framework for short-term, mid-term and long-term JICA's support

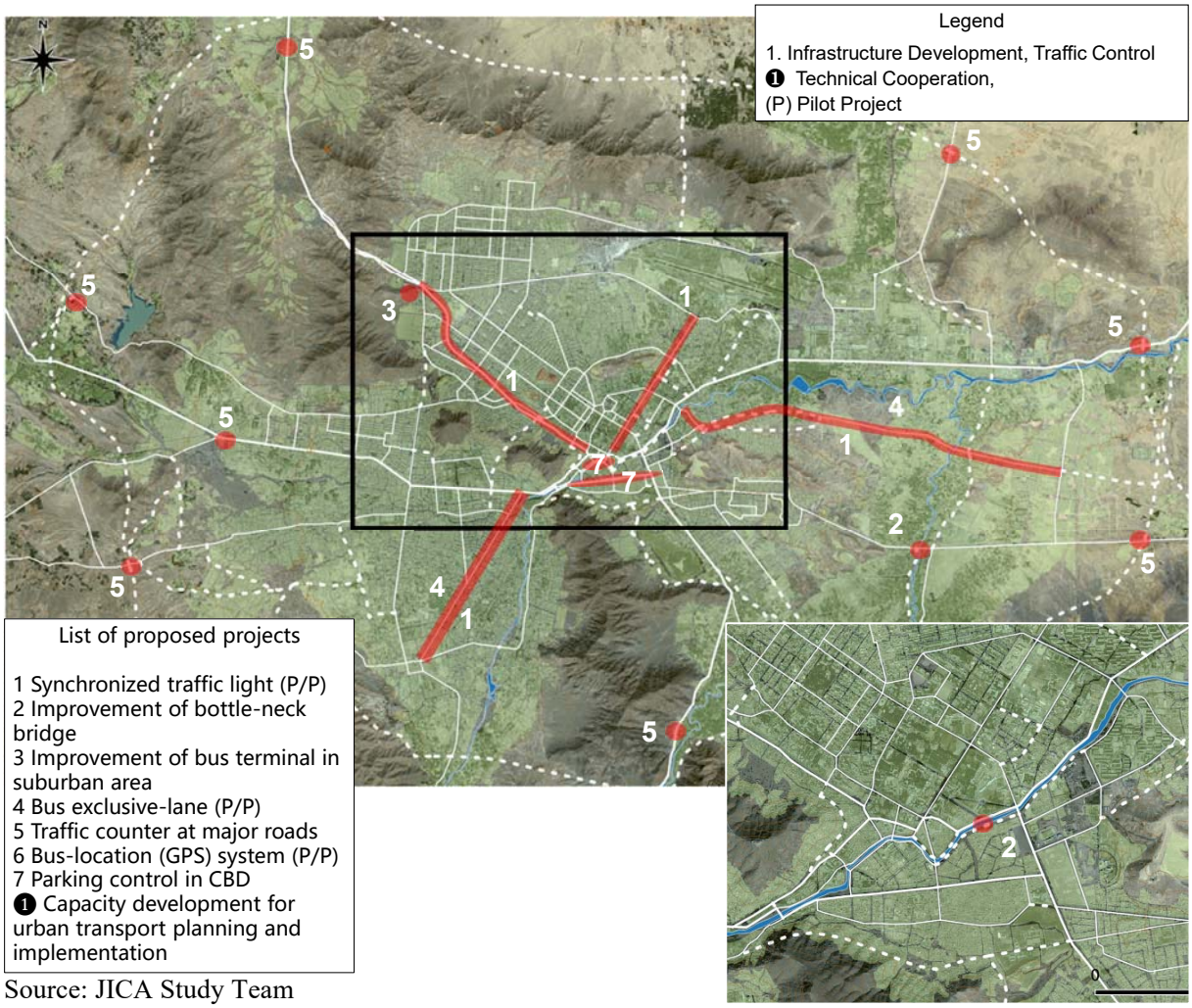
Chapter 6 Direction of support plan for short-term period

6.1 Direction of support for short-term

A concept of short-term support by JICA will focus on the projects along with securing land for roads infrastructure construction projects as well as traffic control and public transport management utilizing digital and ICT technologies which are easy to introduce for transport sectors.

6.2 Specific plans for short-term

The figure below shown the locations of specific projects proposed as short-term solutions (however without technical cooperation projects).



Source: JICA Study Team

Figure 6.2.1 Location of proposed projects for short-term

6.3 Remarks on direction and support plans for short-term

- When discussing each of the programs, particularly when the cooperation supporting a project is in the form of a grant, it is necessary to be aware that highly accurate cost estimation will be required at an early stage.
- A menu of many different items will be involved in planning road infrastructure work, support for public transportation, traffic control, and other such projects. This means methods will have to be worked out to devise fair, objective and understandable evaluations of priorities. Consideration must be given to conducting baseline studies when needed to prepare for such evaluations beforehand.
- BRT development in priority areas, creating bus terminals in suburban areas, and installing traffic signals with advanced functions are closely interrelated, which means it is important to develop proposals that maximize benefits from synergies when several such projects are undertaken.
- Several systems for signal machines exist, which means full attention must be given to enhancing driver convenience and safety when selecting the type of signal to be used. In addition, the systems will be installed where the electric power supply situation is not good. Accordingly, consideration must be given to securing a system which makes a stable supply of power possible, and providing backup delivery systems.
- It is necessary to proceed with bridge improvement and construction work in a way that avoids interfering with transportation. Careful attention must be given to this point when work is to be done in areas with heavy traffic.

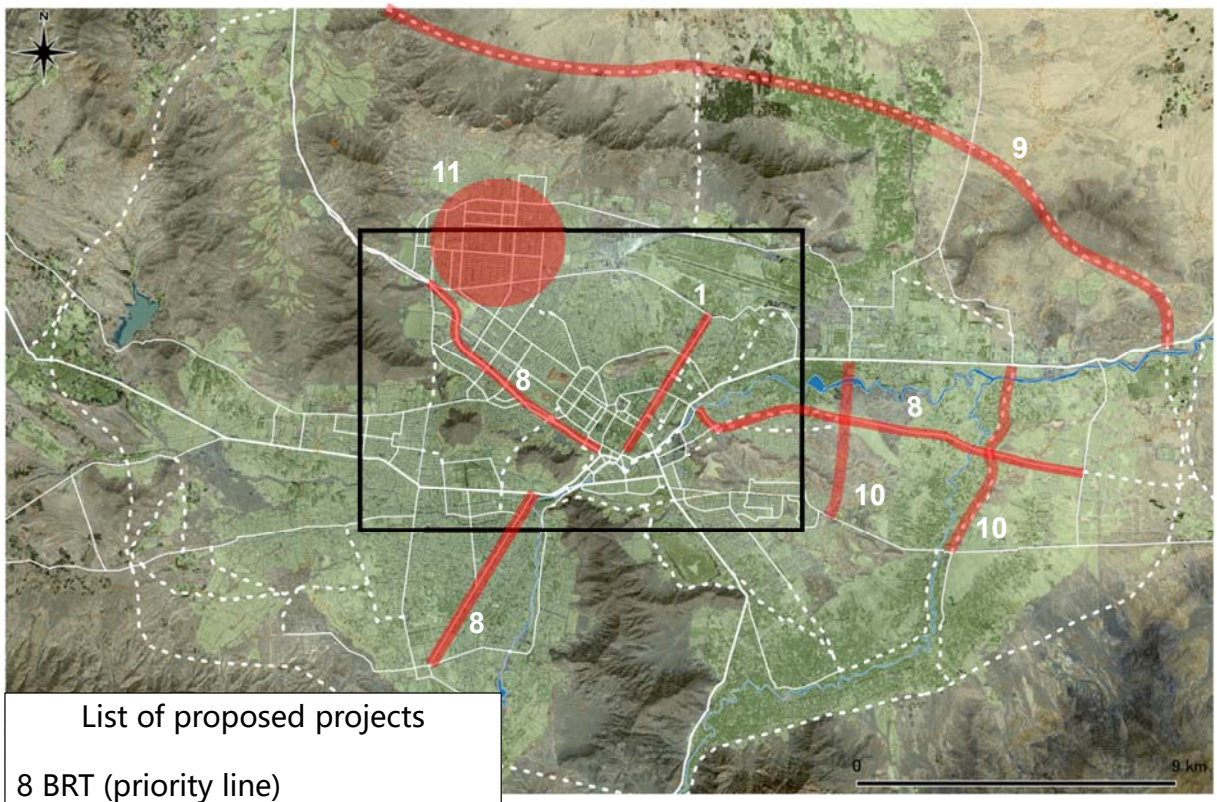
Chapter 7 Direction of support plans for medium-term period

7.1 Direction of support for medium-term

Road infrastructure projects which are relatively large in scale and a substantial amount of time is required for development are focused. Also projects of infrastructure for operation BRT/BHLS and strengthening the bus network are focused.

7.2 Specific plans for medium-term

The figure below shows the locations for specific projects, which are proposed in medium- and long-term programs (with the exception of technical cooperation projects).



List of proposed projects

8 BRT (priority line)
9 KORR (priority section)
10 Missing roads development
11 Improvement for municipality roads and community roads
12 Data center
❷Capacity development for traffic data utilization

Legend
1. Infrastructure Development, Traffic Control
❶ Technical Cooperation,
(P) Pilot Project

Source: JICA Study Team

Figure 7.2.1 Location of proposed projects in medium-term

7.3 Remarks on direction and support plans for medium term

- When discussing each of the programs, particularly when the cooperation supporting a project is in the form of a grant, it is necessary to be aware that highly accurate estimation will be required at an early stage.
- As in the case of short-term projects, menus of many different items will be studied in planning road infrastructure projects, support for public transportation, traffic control, and other work. Methods will

have to be worked out to devise fair, objective and understandable evaluations of priorities. Long periods of time are needed for discussion and implementation, which means careful consideration must be given to the schedules needed for surveys and project implementation.

- Ring road development projects are large-scale. Many persons hold the opinion that only limited effects can be expected from them. For this reason, it is important that consideration be given to which road sections are a priority. Adjustments and cooperation with other donors should be discussed before moving ahead with these projects.
- The evolution of solutions involving the use of digital ICT is very rapid. It is very likely that conditions will greatly change. This should be kept in mind when considering the outlook for medium- and long-term programs. Diligent collection of information and a flexible approach are required.

Chapter 8 Proposal for technical cooperation on urban transport improvement in Kabul Metropolitan Area

8.1 Project summary

8.1.1 Overall goal

Traffic management will be implemented to alleviate traffic congestion in Kabul Municipality. Comfortable, effective and efficient public transportation services will be provided.

8.1.2 Project purpose

The implementation capacity of Kabul Municipality to manage the implementation of projects related to urban transportation will be strengthened.

8.1.3 Outcome

- (1-1) Traffic survey and analysis using the smart digital technology will be implemented.
- (1-2) The Kabul Municipality Urban Transport Master Plan will be updated.
- (2-1) A pilot project related to an effective traffic management will be planned and initiated through analysis and simulation aiming at elimination of traffic bottlenecks.
- (2-2) For introduction of an effective public transportation system, a public offering was made for BRT/BHLS pilot route operation and management projects, which will begin operation.
- (3-1) A roadmap/action plan for the realization of the Kabul Municipality Urban Transportation Master Plan will be developed, and implementation policies for transportation demand management will be proposed.

8.2 Implementation organization

1) Directorate of Infrastructure Planning
2) Directorate of Public Transport
3) Directorate of Traffic Coordination and Management

8.3 Points to be considered for implementing technical cooperation

8.3.1 Lessons learnt utilizing from the similar projects in the past

There is always a risk that the results of technology transfer will be limited due to change of the Kabul Municipality Government staff members. For this reason, the "Kabul Municipality Road Construction Management Project" (2016-2021) has provided a direct training of trainers (Training of Trainers) by training in Japan and in third countries in order to maximize the results of the training work under conditions where

the overseas travel of experts is restricted. The Training of Trainers program has achieved success by adopting a remote support method using horizontal deployment (Peer Training) by instructors who received direct instruction and On-the-job Training by the implementing the local on-site institution. The same approach will be adopted in this project as we envision implementation of the training system which will not be affected by the transfer of Kabul Municipality Government staff members, in the mid- to long-term, by securing the young human resources and raising the level of human resources related to urban transportation.

8.3.2 Prospects for collaboration with the third countries

Collaboration with regions where are implementing similar projects, mainly in Asia, the Middle East, and Latin America, for updating urban transportation master plans (including traffic surveys) and for effective traffic management and introduction of urban public transportation such as BRT can be envisaged.

8.3.3 Cooperation with other donors

As the main donor support for urban development or urban transportation in Kabul Municipal Government, the World Bank is supporting the Kabul Municipal Development Program (KMDP) (2012-2021) (Grant 110 million USD) to improve administrative services, financial management systems, and emergency response capacity in Kabul Municipal Government. The World Bank has also supported the Kabul Urban Transport Efficiency Improvement Project (KUTEI) with a 90.5 million USD grant (2014-2020) to rehabilitate arterial roads and improve the associated construction supervision capacity and project management capacity by the PMU.

8.3.4 Synergistic effect with previous Japanese support

JICA has been providing technical assistance for the formulation and updating of the urban development master plan in Kabul Municipality and the introduction of urban development methods to realize the plan. JICA has also provided technical assistance for the construction of roads and bridges and their maintenance to eliminate traffic bottlenecks in Kabul Municipality. In the area of urban transportation, in 2003, JICA provided 115 buses and 252 bus stops to strengthen the public transportation system in the city of Kabul Municipality. Currently, as an introduction to this project, we are organizing the necessary information to be able to provide technical assistance for medium- to long-term improvement of urban transportation in Kabul Municipality, and providing basic technical assistance to the Kabul Municipal Government through workshops and other activities related to urban transportation planning.

Chapter 9 Training in third countries/training in Japan (draft plan)

Due to the drastic political change in Afghanistan in August 2021, the third country trainings which were planned for this study could no longer be possible. Prior to that, two training sessions were scheduled in Delhi, India, and one in Jakarta, Indonesia; however during the study period, the global pandemic of the COVID-19 made it difficult to travel abroad. For this reason, several other alternative third-country locations where travel would be relatively easy even with the spread of the COVID-19 were considered. However, after the fall of Kabul, 15 August 2021, it is impossible to conduct both third-country training and the training in Japan.

MAIN REPORT

Chapter 1 Introduction

1.1 Background of the study

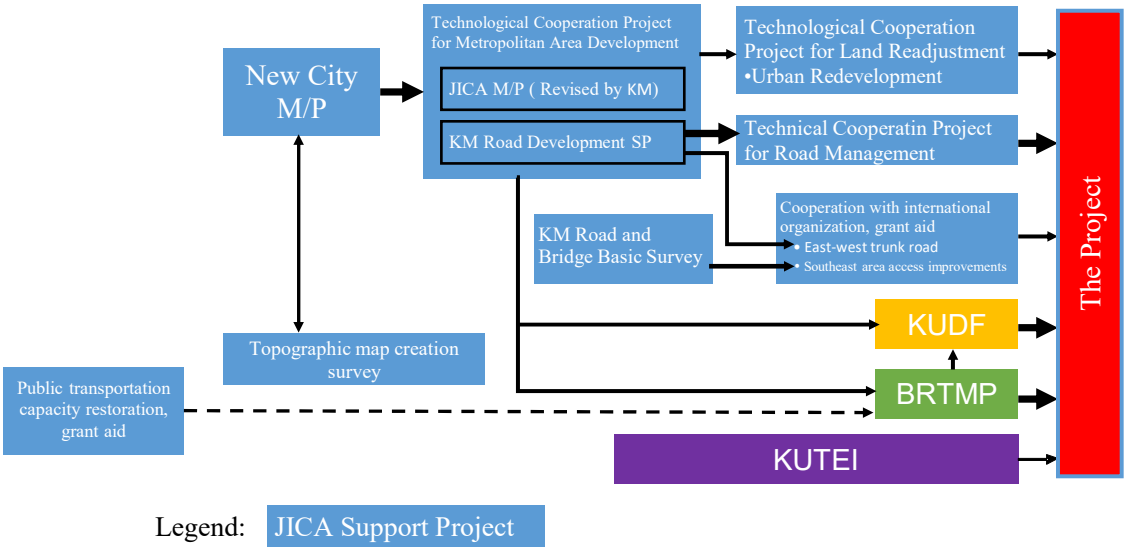
Kabul, the capital of Afghanistan, is experiencing a population influx at a rapid pace. The population of Kabul Municipality (hereafter referred to as "KM") continues to grow at the fastest pace in the world, from an estimated 1 million in 2001 to approximately 5 million in 2018 (Central Statistics Report). As a result, the number of automobiles in the city has been increasing (approximately five-times in the 10 years since 2008, according to the Central Statistics Report), and traffic congestion in the center of the city has been growing more intense each year. During the morning and evening peak hours, traffic on the major arterial roads stops as if in a parking lot, and a normal 10-minute travel distance can take an hour in the worst cases. The economic loss and the impact on the local and global environment due to traffic congestion are serious social problems that show no signs of improvement. Meanwhile, infrastructure development such as the construction of roads and parking lots is lagging behind the higher-than-expected population growth and the rapid progress of motorization. In addition to the above, the poor public transportation services spur the use of automobiles. Currently, Traffic Demand Management (hereafter referred to as “TDM”) to control traffic demand, and “traffic control measures” are non-existent at all.

In order to implement various necessary measures such as expansion of traffic capacity through infrastructure development, reduction in the number of automobiles by improving public transportation, implementation of the TDM and the traffic control measures to operate infrastructure as efficiently as possible, it is essential and urgent to accurately assess the current traffic status, make the accurate traffic demand forecast, and formulate the comprehensive plans. The infrastructure development based on these plans is both essential and urgent.

In the past, Kabul Municipality had planned to develop a new city in the northern part of Kabul Municipality to absorb the rapidly growing metropolitan population. The new city plan (hereinafter referred to as "New City M/P") and a master plan for the existing Kabul Municipality area (hereinafter referred to as "JICA M/P") were developed with the support of Japan International Cooperation Agency (hereinafter referred to as "JICA"). On the other hand, the Ministry of Urban Development and Land (hereinafter referred to as "MUDL") took the initiative to develop a Kabul Urban Design Framework (hereinafter referred to as "KUDF") in 2018 and the Kabul Municipality developed a Bus Rapid Transit Master Plan (hereinafter referred to as "BRT M/P") with respect to public transportation. This is how a multiple higher-level plans with different policies have been developed by multiple entities. In addition, these plans had been using old historical forecast data as a reference. For these reasons, development of an urban transportation master plan for Kabul Municipality that is consistent with the study and development policies based on the latest traffic conditions is required.

JICA has supported the development of road infrastructure in Kabul through the formulation of urban transportation plans and technical cooperation (see Figure 1.1.1). While the need for cooperation in the field of urban transportation in Kabul remains high, it is necessary to accurately understand the current status and issues of urban transportation in Kabul in order to continue to provide effective cooperation with limited resources. It is necessary to create a unified master plan that reflects the above information. And it is also necessary to make a proposal regarding a comprehensive future cooperation policy for promotion of the

implementation of the unified master plan and for development of priority projects.



Technical Cooperation Project for Road Management: Kabul Municipality road construction and management capabilities reinforcement project

Figure 1.1.1 Development of urban transportation infrastructure inside Kabul Municipality

1.2 Objectives of the study

Based on the background described above, the purpose of this survey is to collect and analyze the information necessary to investigate the support that should be provided to improve urban transportation in Kabul in the short- to medium- to long-term.

1.3 Targeted area

The target area shall be the Kabul Metropolitan Area (see Figure 1.3.1). The Kabul Metropolitan Area (hereinafter referred to as “KMA”) includes the Kabul’s 22 central districts as well as neighbouring cities (Charikar, Mamdi-Raki, Sarobi, Maidan Shahr, and Pul-e Alam), but the study will focus primarily on the 22 Districts.

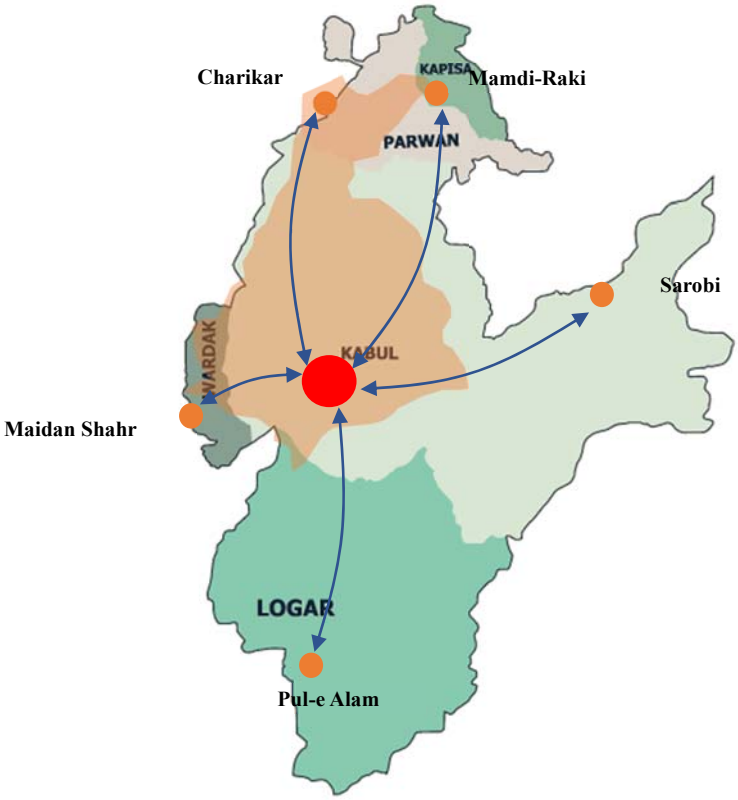
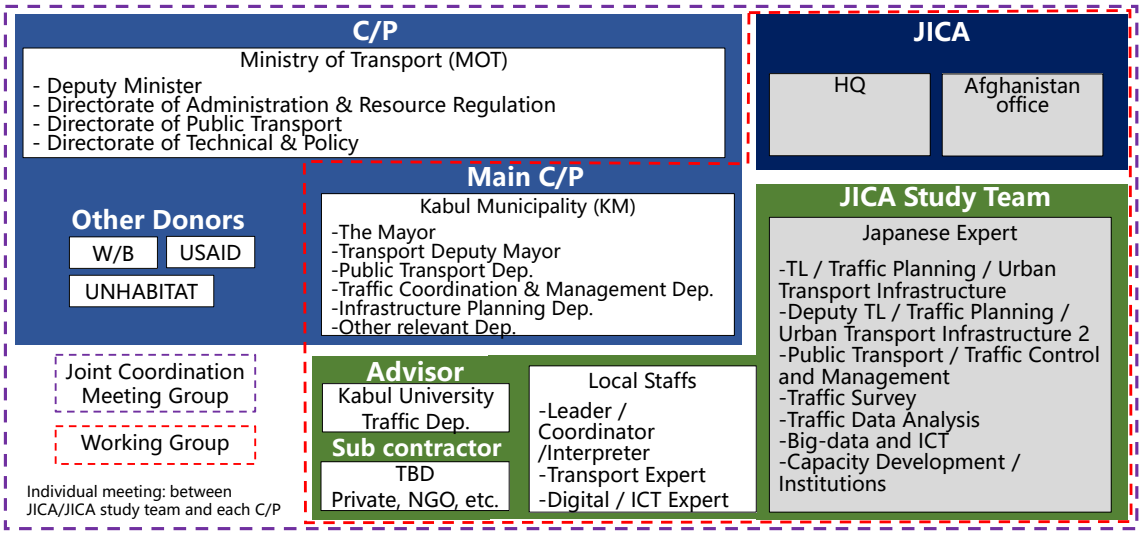


Figure 1.3.1 Targeted areas of this study

1.4 Study framework

Our counterpart is Kabul Municipality (KM). The Ministry of Transport is also a counterpart, since the current public transportation (bus) service is operated by Millibus, which is under the Ministry of Transport. Kabul University also participated in the study as an advisor.



Source: JICA Study Team

Figure 1.4.1 Counterparts of this study

1.5 Study schedule

The flow of work implementation of this project is shown in Figure 1.5.1.

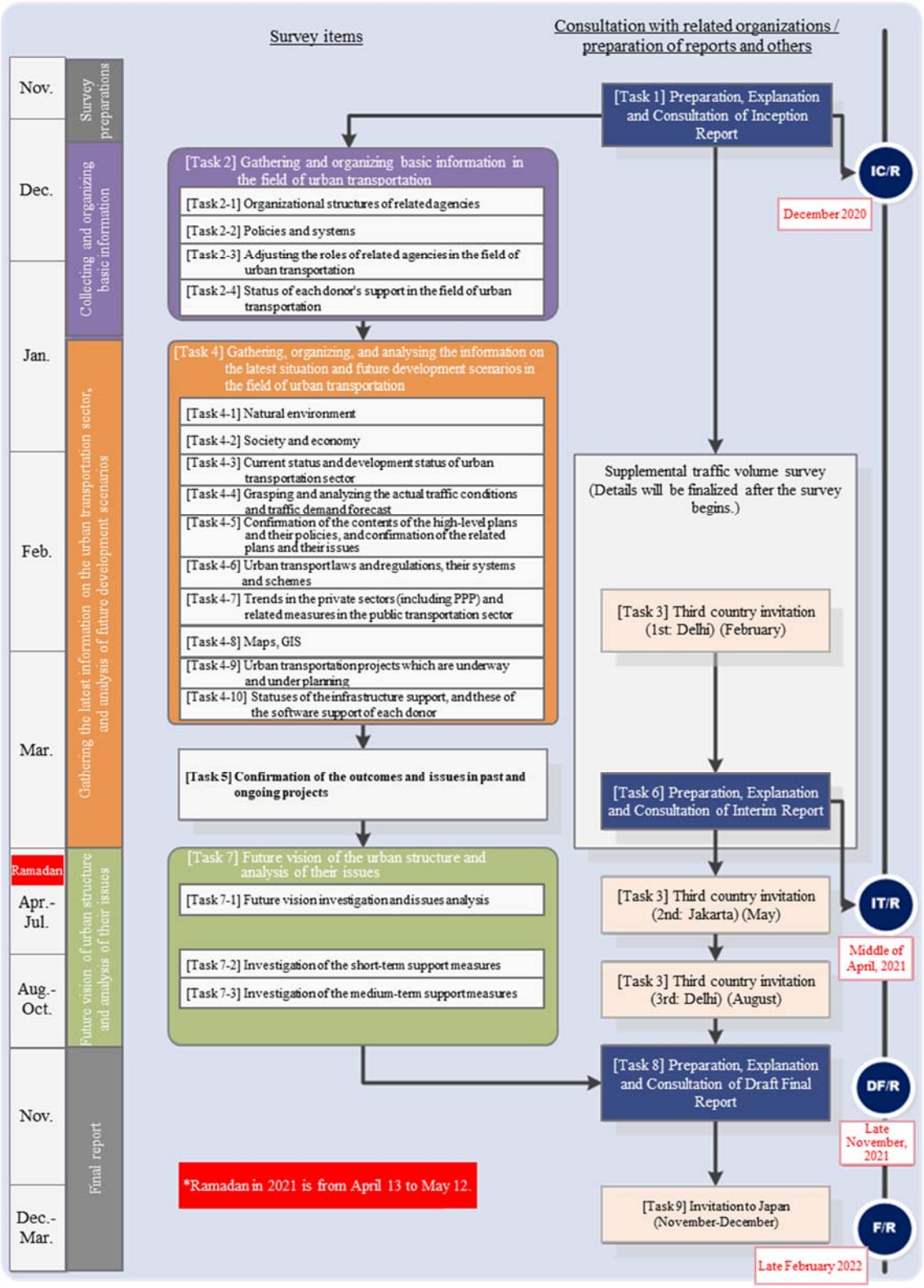


Figure 1.5.1 Flow of the study implementation

1.6 Lessons learned from JICA's previous cooperation with the Afghanistan urban transportation and infrastructure sectors

JICA's recent cooperation with Kabul Municipality for the transportation sector includes formulation of the Master Plan for the Development of Transportation Facilities in the "Kabul Metropolitan Area Development Plan Study (2008-2012)" as a part of the overall development plan for the metropolitan area. In addition, in the part of the technical cooperation project for the road management, JICA has been providing the assistance for improving the management and control capacities to be applied to the road construction and management and maintenance of Kabul Municipality.

The above two assistance studies are closely related to this survey. As for the former assistance, that is the Kabul Metropolitan Area Development Plan Study, approximately 10 years have already passed since the survey was completed. As for the latter assistance of the technical cooperation, the project was completed in May 2021. Table 1.6.1 outlines the main outcomes and challenges during the approximately four years of project implementation. Lessons learned on the tangible and intangible aspects of the project are summarized in Table 1.6.1.

Table 1.6.1 Summary of outcomes and challenges in previous JICA project

	Tangible aspects	Intangible aspects
Outcome	• The traffic congestion in Kabul is correctly identified as a combined factor of both structural deficiencies in the road network due to topographical conditions and lack of traffic manners. Based on this recognition, we have learnt the project planning techniques and the design techniques focusing on improving intersections that are structural bottlenecks which require time to address. • This project has aimed at improvement of the ability to analyze the causes of traffic congestion and plan countermeasures. From which we have learned the skills how to investigate effectiveness after completion of improvements based on micro-simulation skills and other skills.	• An approach to the technology transfer from a remote location was established in success. • As to the local staff, even personnel who are not familiar with road design and road construction have extensively learned the fundamentals of these technologies.
Remaining issues	• There is a lack of knowledge regarding the desirable future road network development as well as the improvement of existing roads. • The lack of drainage capacity, which is one of the factors causing traffic congestion on city streets during rainy weather, has not yet been addressed. • There are areas where appropriate intersection geometry and traffic treatment is not implemented to accommodate traffic volumes. • The remedial actions to the areas where traffic signals are not working or not operating efficiently have not been yet taken.	• The absolute lack of financial resources is a major constraint, as new road infrastructure development projects require large amounts of money. • The instability of the administrative organization (change of top administrators, frequent reorganization) makes it difficult for technology to be entrenched in the organization. • There are high security issues in general in the society, which are very high restrictions on the activities of the projects.

Source: JICA Study Team

1.6.1 Lessons on the intangible aspects which are learned through technical cooperation project for road management

(1) Remote management

The biggest challenge for Technical cooperation project for road management is that no Japanese can travel to the site, and the work must be done remotely. To solve this problem, we believe that we have achieved significant results by adopting the following methods.

Since Japanese staff cannot travel to the site, Japanese experts need to train the local staff in Japan or in a third country. In such cases, only a limited number of Kabul Municipal Government staff could be invited to Japan or third countries, because if a large number of Government staff were invited to Japan or third countries, the normal daily operations of the Government would be affected during the period of the invitation. To solve this problem, a program was devised in which potential trainers were selected from among city employees, and the selected trainers were given training in Japan or a third country (Training of Trainers: TOT). After the selected trainers are returned to Kabul, they give peer training (PT) and On-the-Job Training (OJT) for their colleagues. Furthermore, these three steps could be repeated as a cycle in order to entrench the knowledge and skills. This TOT approach has also been successful in encouraging the Kabul Municipal employees to take the initiative. Kabul Municipal officials highly appreciate the results of this TOT approach by this technical cooperation project and have suggested to the President that all training programs in Afghanistan, including technical cooperation by other donors, should be based on this TOT-PT-OJT method.

(2) Effective utilization of local staffs

Since Japanese experts were unable to travel to the site, it was important to utilize local staff, especially the three technical coordinators, who were key to the technical aspects of the project. The hiring of the three technical coordinators was based on an open application process through a local job site. From among approximately 400 applicants, a preliminary screening was conducted based on reviewing the application materials, a second selection was made based on interviews with local staff leaders, and a final selection was made based on Skype interviews with Japanese experts. These three technical coordinators had relatively high technical skills and experience in their respective fields, and provided technical guidance and support as needed in the field to supplement the guidance of the Japanese experts.

(3) Reorganization of Kabul Municipality and flexible response to changing policies and needs

Kabul Municipality has changed mayor frequently, with four in the five years since 2015. With each change, Kabul Municipality's policies and needs have been shaken up and its organization has been significantly reorganized. Whenever there was a change in the leadership, including the mayor, it was necessary to carefully explain the objectives of the project and its activities to the new management and gain their understanding, and to be flexible in responding to new requests from Kabul Municipality, to the extent possible.

(4) Capacity of Kabul Municipality

The capability of Kabul Municipality was very low in terms of practical capacity when the technical cooperation project "Existing Kabul Municipality Road Development Subproject" started in 2010. Since

then, the practical skills of the staff have improved significantly over the past 10 years. Thanks to the transfer of technology through “the technical cooperation project” and the reorganization that rejuvenated the staff with a high level of education and a willingness to learn. However, during that time, due to staff retirements and frequent reorganizations, the transferred skills and knowledge sometimes were not entrenched in the organization. For this reason, the staff members who received training from Japanese experts at TOT were required to horizontally disseminate their skills and knowledge to their colleagues through PT and OJT as soon as they returned from Japan, and to create manuals of what they had learned and of newly established systems. We believe that the above efforts have greatly improved the practical capabilities of the road design, construction supervision, and maintenance departments in charge of road projects.

On the other hand, the public transportation department and the traffic control departments, which have not been covered in the previous "technical cooperation project" are still a new young department, having been newly established only about five years ago. Although the education level of the staff belonging to these departments is somewhat high, they are mainly young people with little practical experience, and low practical skills. Therefore, when proposing technical cooperation in the future, it is necessary to consider these perspectives.

(5) Management for deteriorating security conditions (security arrangement for local staffs)

The security situation in Kabul continues to be poor, with frequent restrictions on the movement of local staff during the implementation of our technical cooperation project. Security information and regulations had to be constantly collected from the JICA Afghanistan office, and project activities had to be scheduled flexibly in accordance with JICA's regulations, making safety as the top priority.

Regarding the impact of the new coronavirus (COVID-19), Kabul experienced extremely high numbers of infections and deaths for a while and lockdowns, but the city has since returned to its previous state and the number of infections has remained low.

1.6.2 Lessons on the tangible aspects which are learned through technical cooperation project for road management that is currently underway

(1) Identification of traffic bottlenecks

Figure1.6.1 shows bottleneck points and sections where frequent congestions are experienced throughout the weekdays. The analysis of the congestion identified the following factors as the cause, in addition to the lack of road network development and shortage of capacity at intersections:

- Illegal parking: Parking not only on service roads, but also in the main line and at intersections, obstructing traffic.
- Pedestrian Crossing: Not only are pedestrian crossings inadequately maintained, but also are freely used by the people, blocking vehicular traffic, which is a problem from a traffic safety standpoint.
- Vehicles running in the opposite direction: Vehicles running in the opposite direction toward intersections and median openings, which are very congested, are blocking traffic and creating head-on collisions and other hazards.
- Driving manner at intersections: Not only at roundabouts, but also at signalized intersections, vehicles flow into intersections and impede the travel of other vehicles.

- Insufficient skill of traffic control administrators: the location of median openings, the designation of one-way streets, and other traffic control measures are established in a way that impedes the smooth traffic flow.

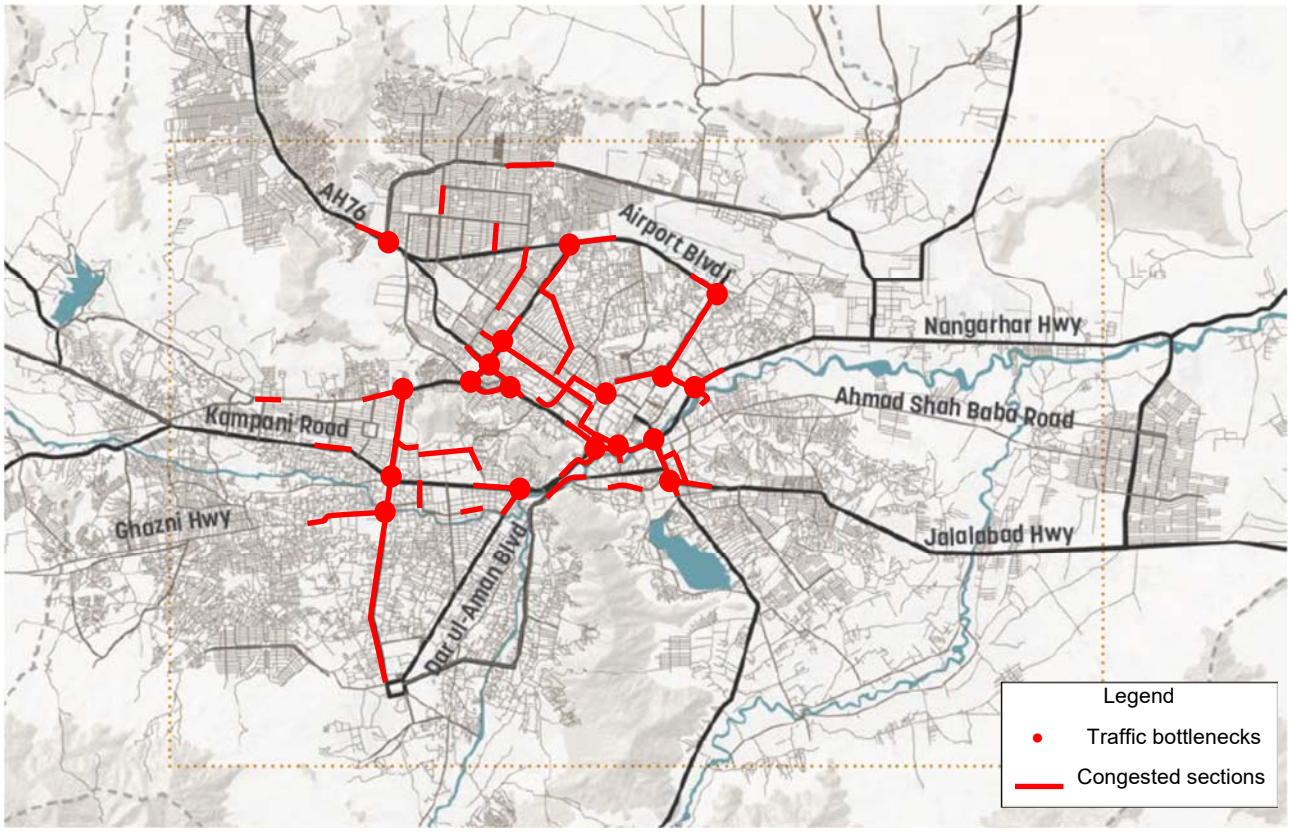


Figure 1.6.1 Major traffic bottlenecks and congested sections

(2) General capacity for planning and design

The capacity for transportation planning is generally lacking. For example, the flyovers built with Turkish support, connecting the north-south direction have not been effective. The flyover to the road, which contains a total of six lanes, three lanes each on the upper section and lower section, has not been very effective because the traffic volume on the elevated portion is low and traffic is concentrated on the service roads and intersecting roads, causing congestion. This is due to the fact that the improvements of the intersections of the service roads and that of the intersecting roads have not been carried out concurrently with the construction of the flyover.

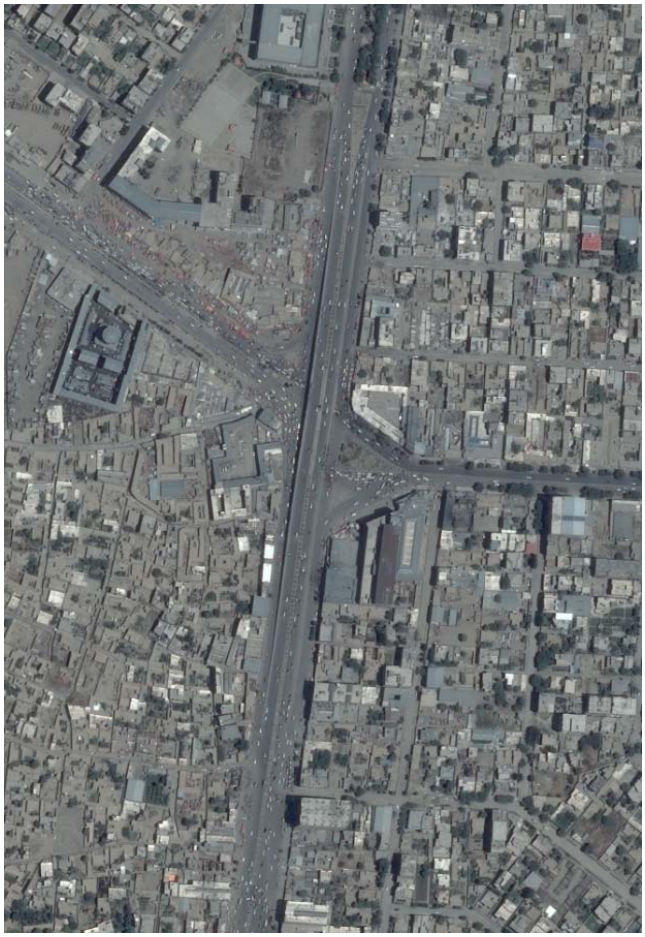


Figure 1.6.2 Flyover construction project by Turkish support

In response to these points, the need for analysis of intersections (including microscopic traffic simulation) led us to acquisition of the corresponding technologies. We have noticed that the staff members have improved their ability to reproduce the current situation, identify problems, and formulate improvement plans that can eliminate traffic congestion.

On the other hand, their level of road design is also low; the Baraki Sara-e-Shamali road, designed in 2017, did not conduct an infiltration coefficient study in the design of permeable gutters. The Baraki intersection that was mentioned above was designed without capacity analysis. The construction of the intersection was completed and started service in 2019, but the above issue became apparent and many traffic congestion complaints were received from citizens. The problem became so big that it was reported by the media. The congestion was caused by the insufficient number of lanes entering the intersection relative to the traffic demand. The problems described above can now be anticipated as the level of road design is improved based on the road design technologies which were acquired through the technical cooperation project. Now, the countermeasures can be taken.

The low quality of road construction was another major challenge. Even if the pavement thickness required for the design daily volume was properly secured, there were cases of early failure due to lack of quality control of asphalt and concrete during construction. The technical cooperation project for road management has provided guidance on the preparation of technical specifications in accordance with the design content and quality control during construction. Since then there was a significant improvement in the quality control. However, it was difficult to provide sufficient human support in the construction

management area, where on-site management is critical, due to the lack of personnel in charge. The future challenge is to pass on the technologies and skills acquired from the technical cooperation project for road management, including the challenge of recruiting human resources.

Chapter 2 Current socioeconomic conditions of Afghanistan and Kabul

2.1 Natural environment of Afghanistan and Kabul

2.1.1 Location

Islamic Emirate of Afghanistan is a landlocked country in Central Asia, bordering Pakistan to the south and the east, Iran to the west and Turkmenistan, Uzbekistan and Tajikistan to the north, and the country's northeastern tip is bordered by China. It is in an area once called the "Crossroads of Civilization" that connected the east-west traffic route of the Eurasian Continent and India.

The capital of Afghanistan is Kabul City of Kabul Province and it has been an important point of transport over the ages even from the time of Silk Road. Kabul City is situated in a southern valley of the Hindu Kush mountain range. Recently, the city has encountered a range of urban issues due to a rapidly swelling population and the chaotic urbanization process.

Figure 2.1.1 Location of Afghanistan

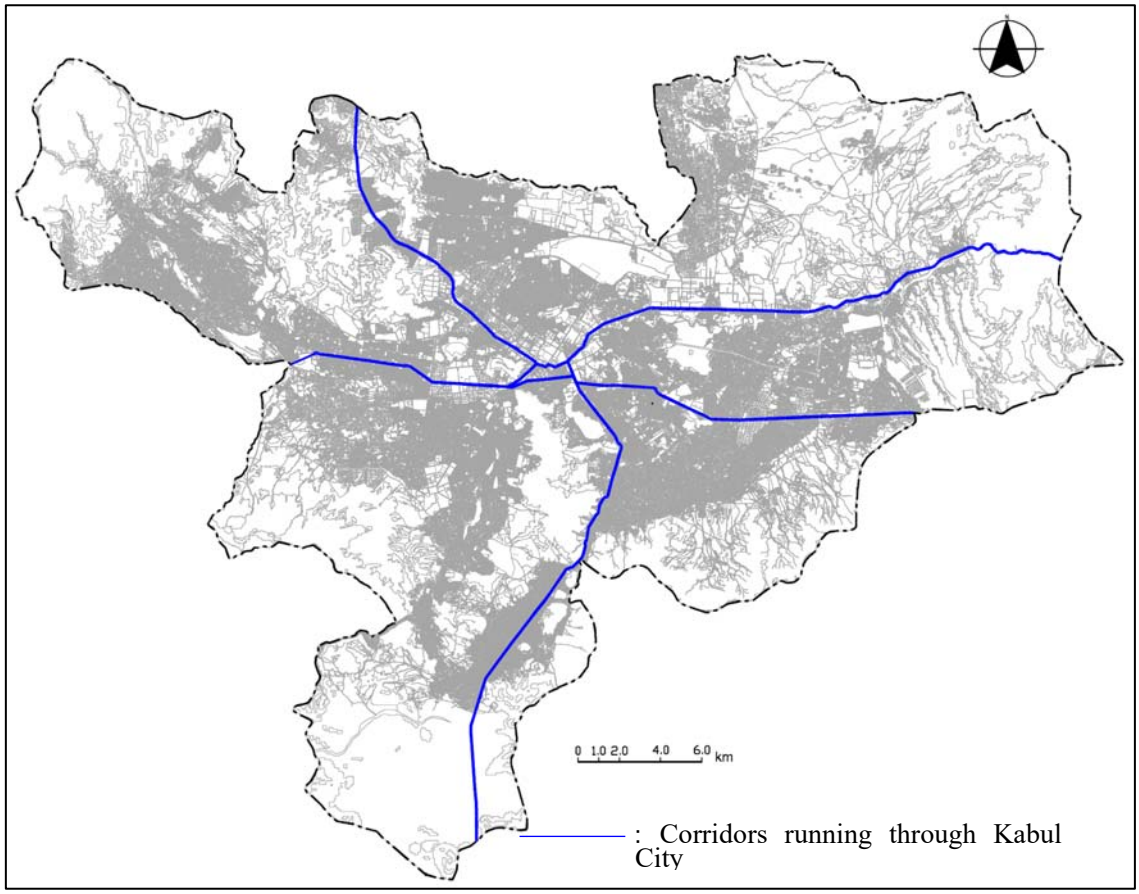


Figure 2.1.2 Location of Kabul

2.1.2 Geography and landforms

Afghanistan has a land area of 650,000 km^2 and it is composed of 34 provinces in total. Its south is occupied by deserts and the north and the southwest have plains, while about three quarters of the land area is rugged mountainous areas stretching in the Hindu Kush mountain range. In Afghanistan, rivers are mostly inland rivers disappearing in desert areas and only the Kabul River joins the Indus River to flow into the Arabian Sea near the City of Karachi of the neighboring country, Pakistan.

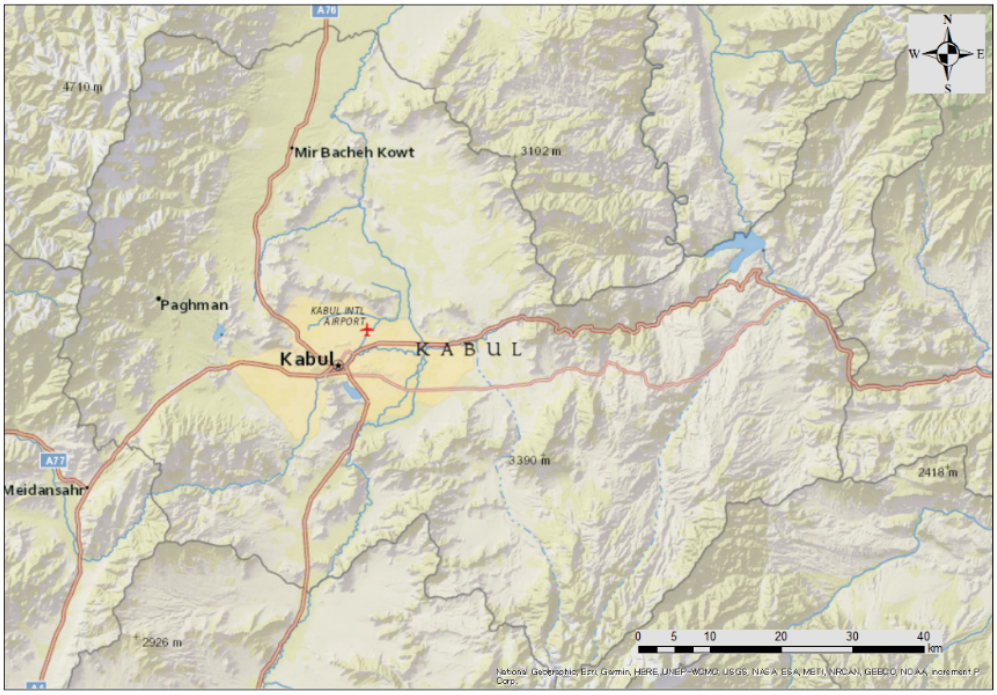
The capital city of Kabul is located in Kabul Province and has a total area of 4,461 km^2, 1,800-1,900 m above the sea level. The city is surrounded by mountains as high as 2,000-4,000 m in every direction. Due to these geographical constraints, Kabul City has been forced to develop its roads and transport infrastructure within a very limited space of the capital.

Source: UN

Figure 2.1.3 Provinces of Afghanistan

Source: UN

Figure 2.1.4 Topography of Afghanistan

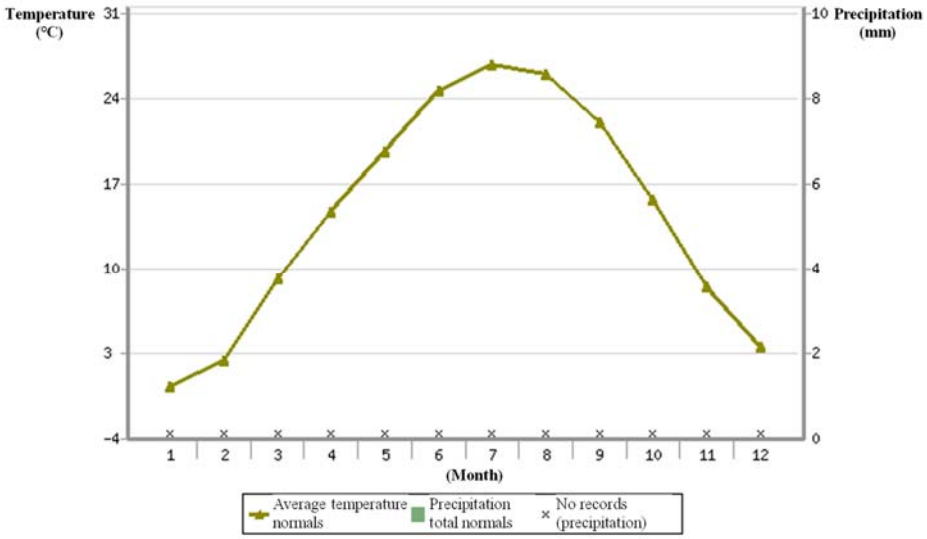


Source: UN

Figure 2.1.5 Topography of Kabul

2.1.3 Climate

Afghanistan has a continental climate and the temperature fluctuates largely between warm and cold days throughout the year. The country has generally two seasons, the dry season from April to November and the rainy season from December to March, with a short period of spring between the two seasons. In May to August, there is almost no rainfall and the temperature goes up to over 30 degrees Celsius. On the other hand, between December and February, the temperature drops severely, and it sometimes reaches to 10 degrees Celsius below zero and there are snowfalls sometimes which even cover the ground. In recent years, the country experiences droughts due to less rainfalls and rising temperatures.



Source: Afghanistan Meteorological Department

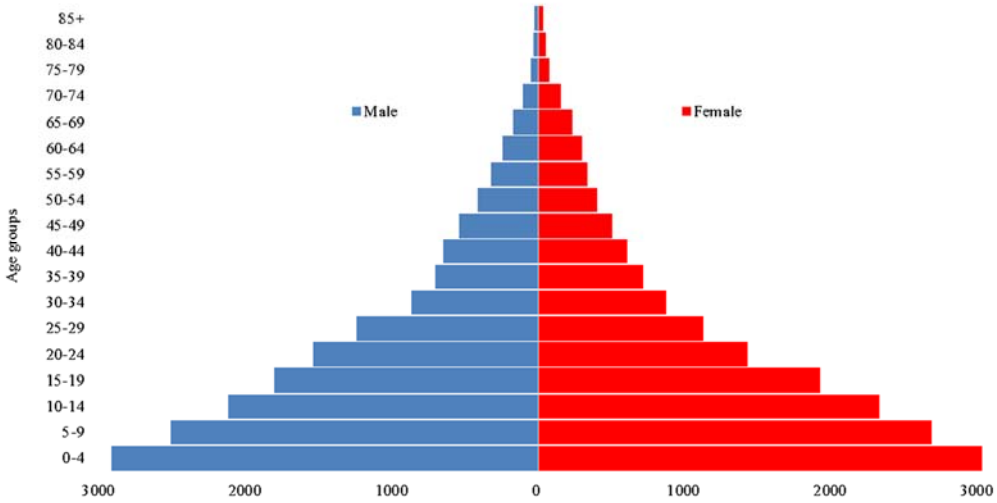
Figure 2.1.6 Average temperatures and precipitations in Kabul

2.2 Socioeconomic condition of Afghanistan and Kabul

2.2.1 Population

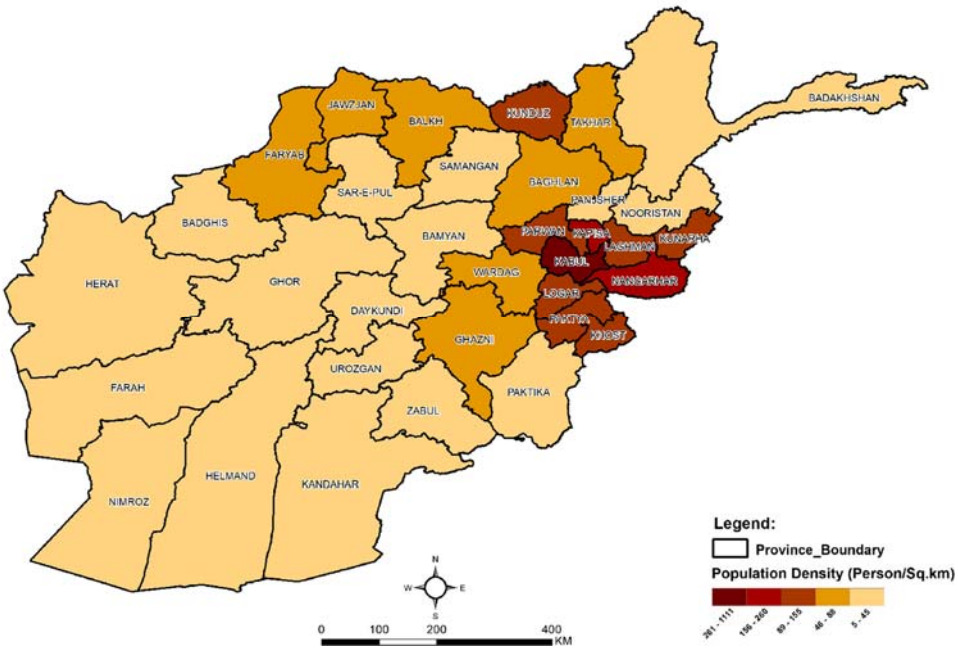
In 1399 of Solar Hijri calendar year (2020-2021), Afghanistan had a population of about 32.9 million. Of the total population, about 23.4 million lived in rural areas and about 8 million in urban areas, while about 1.5 million were nomadic. When looking at the population by age category, about 47.2% (15.5 million) of the total population are younger than 15 years old and people at the age 65 or older account for about 2.5% of the total population. This indicates that the population of Afghanistan will increase further in the future.

According to data on the population and the population density by province, Kabul Province where Kabul City is situated has the largest population and population density. At a country level, Afghanistan has the largest population concentration in its eastern part which includes Kabul Province and its surrounding areas. Kabul Province has about 15.8% of the country's total population and people continue to flow into the capital.



Source: National Statistics and Information Authority (NSIA)

Figure 2.2.1 Population by age group



Source: National Statistics and Information Authority (NSIA)

Figure 2.2.2 Population density by province (2020-2021)

Table 2.2.1 Population by province (2020-2021)

No.	Province	Population	Percentage	No.	Province	Population	Percentage
1	Kabul	5,204,667	15.8%	18	Takhar	1,093,092	3.3%
2	Kapisa	488,298	1.5%	19	Kunduz	1,136,677	3.5%
3	Parwan	737,700	2.2%	20	Samangan	430,489	1.3%
4	Wardak	660,258	2.0%	21	Balkh	1,509,183	4.6%
5	Logar	434,374	1.3%	22	Sar-e-Pul	621,002	1.9%
6	Nangarhar	1,701,698	5.2%	23	Ghor	764,472	2.3%
7	Laghman	493,488	1.5%	24	Daykundi	516,504	1.6%
8	Panjsher	169,926	0.5%	25	Urozgan	436,079	1.3%
9	Baghlan	1,014,634	3.1%	26	Zabul	384,349	1.2%
10	Bamyan	495,557	1.5%	27	Kandahar	1,399,594	4.3%
11	Ghazni	1,362,504	4.1%	28	Jawzjan	602,082	1.8%
12	Paktika	775,498	2.4%	29	Faryab	1,109,223	3.4%
13	Paktya	611,952	1.9%	30	Helmand	1,446,230	4.4%
14	Khost	636,522	1.9%	31	Badghis	549,583	1.7%
15	Kunarha	499,393	1.5%	32	Herat	2,140,662	6.5%
16	Nooristan	163,814	0.5%	33	Farah	563,026	1.7%
17	Badakhshan	1,054,087	3.2%	34	Nimroz	183,554	0.6%

*The nomadic population of about 4.6% (about 1.5 million) is not included in this table.

Source: National Statistics and Information Authority (NSIA)

Meanwhile, the population of Kabul City was about 4.22 million in 2008 when the JICA M/P was established, and the population was expected to reach 4.88 million by 2020 at a growth rate of about 1.2% (between 2008 and 2020).

In Kabul City, the population increased particularly rapidly in the outer edge districts of 17, 20 and 21, with an annual growth of 7-8%. In contrast, the city's central area has seen almost no change in population.

Table 2.2.2 Population by district in Kabul

District	Total	Land area (km2)				Population			
		Residential		Residential share (%)		M/P	Estimated	Density(/ha)	
		2008	2020	2008	2020	2008	2020	Total	Urban
Total	1022.7	295.6	369.6	28.9	36.1	4,220,256	4,878,470	41.3	142.8
1	4.8	3.3	2.4	68.7	50.1	35,402	25,803	73.3	106.6
2	6.8	5.9	4.6	86.3	67.6	83,295	65,238	121.8	141.2
3	9.1	8.2	6.9	90.2	75.8	139,742	117,465	153.4	170.0
4	11.7	11.3	9.4	96.2	80.5	204,049	170,653	174.1	180.9
5	28.5	15.3	17.4	53.8	61.3	283,489	322,507	99.6	185.0
6	49.2	16.7	16.3	34.0	33.1	285,255	278,061	58.0	170.7
7	33.3	21.4	22.3	64.1	66.8	416,675	434,625	125.0	195.1
8	48.3	18.4	15.8	38.1	32.7	331,554	284,495	68.7	180.5
9	24.3	18.0	19.1	74.1	78.6	188,569	200,036	77.5	104.6
10	13.0	10.8	10.2	83.0	78.1	270,157	254,258	207.3	249.9
11	17.4	12.7	13.0	72.6	74.7	287,853	296,254	165.2	227.6
12	34.9	22.2	28.6	63.6	81.9	298,847	385,346	85.6	134.7
13	47.2	27.0	33.8	57.2	71.7	467,440	585,828	99.1	173.3
14	119.0	9.5	11.0	8.0	9.2	147,910	171,032	12.4	155.5
15	32.5	20.0	24.2	61.5	74.5	200,465	242,896	61.6	100.2
16	25.1	9.4	10.9	37.5	43.4	206,701	239,177	82.4	219.7
17	56.0	15.4	37.7	27.5	67.3	248,926	608,278	44.4	161.3
18	33.9	5.8	4.8	17.2	14.2	33,958	27,945	10.0	58.1
19	141.4	15.9	22.7	11.2	16.1	3,906	5,601	0.3	2.5
20	142.9	13.2	35.6	9.2	24.9	31,836	85,837	2.2	24.1
21	64.0	2.8	6.5	4.4	10.1	6,040	13,899	0.9	21.5
22	79.3	12.4	16.3	15.7	20.6	48,187	63,236	6.1	38.8

Source: JICA Study Team

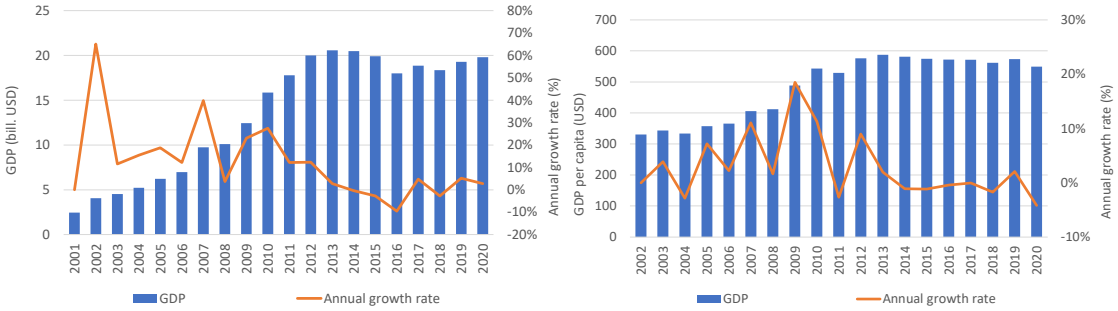
2.2.2 Economy

The domestic economy and the social infrastructure of Afghanistan had been catastrophically damaged by the conflict that began in 1970s and continued for years. In 2001, when the Taliban regime collapsed, a new regime was founded and efforts to establish peace and recovery began. In the 10 years since 2002, thanks to international assistance, Afghanistan could focus on rapid economic growth and improvement of social infrastructure. The average growth rate from 2003 to 2012 reached as high as 9.4% as the result of the enhanced service industry and the strikingly grown agriculture sector, which were both the result of the international assistance. Later, between 2015 and 2020, however, the country's annual growth stayed low at 2.5% on average, since a wide range of factors delayed the progress of the economy including issues related to domestic security and international factors. As seen in these facts, Afghan economy is still vulnerable and in fact it has to rely on international aids and assistance even now.

Table 2.2.3 Changes in nominal GDP and GDP growth rate

	GDP		GDP per capita	
Year	(bill.USD) in current price	Annual growth rate	Per capita (USD) in constant price	Annual growth rate
2001	2.46	-	-	-
2002	4.06	65%	330.30	-
2003	4.53	12%	343.08	4%
2004	5.23	15%	333.32	-3%
2005	6.21	19%	357.23	7%
2006	6.97	12%	365.23	2%
2007	9.75	40%	405.55	11%
2008	10.11	4%	412.11	2%
2009	12.44	23%	488.30	18%
2010	15.86	27%	543.30	11%
2011	17.80	12%	528.74	-3%
2012	20.00	12%	576.19	9%
2013	20.56	3%	587.57	2%
2014	20.48	0%	581.06	-1%
2015	19.91	-3%	574.18	-1%
2016	18.01	-10%	571.68	0%
2017	18.87	5%	571.45	0%
2018	18.35	-3%	561.62	-2%
2019	19.29	5%	573.29	2%
2020	19.81	3%	549.39	-4%

Source: The World Bank



Source: The World Bank

Figure 2.2.3 Changes in nominal GDP and GDP growth rate

2.2.3 Industries

When looking at Afghan GDP composition of 2020 by industry, the agricultural industry accounts for 27.1%, the manufacturing industry 12.47%, the service industry 56.07% and the trade industry 4.45%.

2.2.4 Financial conditions of Kabul Municipality

About one half of the total budget of Kabul City comes from the city's independent financial resource and the other half comes from of the national government subsidies. The size of the total budget fluctuates largely from year to year, and the financial scale amounted to about US$144 million (JP¥l6 billion) in 2021. Every year, 40-60% of the total budget goes to the road and transport sector, which indicates that higher priority is given to the sector.

Table 2.2.4 Budget of Kabul Municipality and proportional allocation to the road sector

Year	KM Budget (55%) (A)	Subsidies from the central government Finance Ministry (B)	Total (C= A+B)	Road Sector (%)	Ordinary budget (Salary, Oil, Maintenance, etc. (45% of Revenue)
2011	29.15	29.50	58.65	38.09	23.80
2012	35.32	23.20	58.52	26.37	28.80
2013	40.00	30.40	70.40	34.20	32.72
2014	39.33	63.60	102.93	47.10	31.95
2015	38.10	58.24	96.34	73.20	31.65
2016	38.60	65.13	103.73	83.93	31.11
2017	34.48	79.44	113.92	79.44	28.21
2018	69.23	32.07	101.30	50.77	32.33
2019	38.03	35.30	76.70	53.70	33.12
2020	41.60	82.57	124.21	89.40	37.99
2021	63.40	80.50	143.90	107.90	33.40

Source: Kabul Municipality

2.3 Higher level programs on urban and infrastructure development

Afghanistan's national plans for urban transport along with related strategies and prioritized programs were identified and profiled. Meanwhile, information was collected, organized and analyzed in relation with the proposed policies for the urban and transport area, priority issues and how prioritized programs and

projects have progressed. The same was conducted on the progress of programs to reform the urban and transport sector and improve relevant organizations' capacity and the issues found along the progress.

Table 2.3.1 Targeted National Urban Transport Plans, Strategies and Prioritized Programs

Related Plans, Strategies and Programs	Summary
Afghanistan National Peace and Development Framework (ANPDF, 2017-2021)	It is a national economic and societal development plan established to shift the country's objectives from reconstruction to economic development and its basic policies include: (1) Enhancement of governance; (2) increase in national revenue collection and investment in the economic and social sector; (3) increase in productivity thorough investment in energy infrastructure, promotion of investment in the private sector and urban development; and (4) promotion of women's participation in the development process.
Transport Sector Master Plan (ATSMP 2017-2036)	After having analyzed the status quo and issues of the transport sector, in the Transport Sector Master Plan, it is proposed that the Afghan transport sector needs to transform itself and priority projects need to be set up for subsectors, such as roads, railways, urban transport, airports, promotion of trade and logistics. Specifically with respect to urban transport, it is proposed that the development of Kabul Urban Transport Master Plan should be set up along with projects for the development of BRT and the construction of Kabul Ring Road.
Afghanistan Green Urban Transport Strategy (AGUTS, 2014-2024)	The development of the strategy was led by the Traffic Technology Center of Kabul University and in this strategy, it was proposed that an efficient mechanism should be constructed to offer transport service including urban cargo transport, which is safe, efficient, available at reasonable cost, reliable, friendly to the environment, well planned and concerned about land use as well as to build research quality and capacity.
National Priority Programs (NPPs)	Under the leadership of the Ministry of Finance and based on the development policy established and managed by the interministerial cabinet meeting, NPPs, as priority programs, are established for each sector by relevant ministries and agencies, after the goals were set up by political leaders. According to NPPs, national budgets are compiled so that the ministry in charge can implement such programs. The sectors for which NPPs were established include, infrastructure planning, urban development and other 10 sector programs.
National Infrastructure Development Plans (2016-2025)	As a strategy for the infrastructure sector, it is proposed: (1) Development of regional network plans and improvement of the priority project selection process; (2) sustainable development, cost recovery, financing of maintenance cost and development of maintenance system; (3) promotion of participation of Public Private Partnership (PPP) and the private sector in facilities development and operation/maintenance; (4) increase in orders to be placed to domestic contractors for road construction; and (5) improvement of project management through human resource development. As a priority project for urban transport, the following is proposed: (1) Construction of Kabul Ring Road; (2) development of an urban BRT routes; (3) public transportation and transport technology; (4) intelligent transportation system; and (5) programs for mitigating negative impacts on the society and education to improve awareness concerning compliance with traffic rules and regulations.

Related Plans, Strategies and Programs	Summary
Urban National Priority Programs (U-NPPs, 2016-2025)	In the U-NPP mechanism, policies, strategies and priority programs are proposed around the three pillars as follows: (1) Improvement of urban governance and system; (2) provision of appropriate houses and basic services to every citizen, and (3) use of urban economy and infrastructure (harnessing). The above pillar (3) has a component, that is, "development of sustainable and well-balanced transport system and infrastructure and provision of related services." In this component, priority is put on: (a) Programs for the public transportation system and investment in BRT, Milliebus, facilities related to bicycles and pedestrians' facilities, LRT, etc.; (b) programs on an international airport in the vicinity of Kabul City (to be developed in 2025 or later); (c) improvement of urban logistics including development of traffic nodes that can support intercity transportation and connect trade routes; (d) integration of transport and land use programs; and (e) promotion of citizens' awareness of transport-related laws, regulations and administration as well as safe, secure and reasonable transportation means for vulnerable users of transportation means, etc.

Source: Prepared by the Study Team based on related plan documents. Underlined parts are policies related to urban programs, urban development, and transport and traffic sector.

There are laws related to urban traffic, including the Road Traffic Law (related to drivers' licenses, vehicle registration, traffic administration, traffic safety, etc.), relevant Executive Orders (in Dari and Pashto languages), and the Public Transport Framework, among others. It was found that the Public Transport Framework has a range of information for the survey team to consider for this survey, including the status quo and issues of public transport in the Kabul metropolitan area, infrastructure development to be carried out, public transport services, organization structure, and budgets and work processes.

2.3.1 Afghanistan National Peace and Development Framework

The Afghanistan National Peace and Development Framework (ANPDF) defines the framework to change the national goals from reconstruction after the 40-year long conflict to realization of national makeover to improve the country's economic development and national welfare. ANPDF has the following basic policies: (1) construction of a system for establishing national development programs, improvement of governance and effective administration process; (2) national revenue collection of 14% of GDP, investment for growth and the social sector, with the ratio of 70:30, respectively; and (3) investment in energy infrastructure, promotion of investment and development of the private sector, improvement of productivity through urban development, enhancement of competitiveness between surrounding countries, and securing of employment, etc. In addition, another important policy is proposed: (4) promotion of women's participation in development.

2.3.2 Transport Sector Master Plan

The Transport Sector Master Plan was updated from the previous plan (2006-2016) that was targeted the entire country. The updated plan sets up policies and strategies for relevant authorities/organizations in the areas of roads, railways, urban transport, private aviation, trade and logistics as well as action plans to realize the master plan.

In an analysis of the status quo of the area of urban transport, the updated master plan indicates that (1) Kabul City has been growing at the highest speed in the world and the city is located right in the center of the Afghan economy (2) the location of Kabul City surrounded by mountainous areas, which restricts the

development of road networks. The new master plan also pays attention to some issues that the country's cities as a whole have, that is, (3) underinvestment in infrastructure, (4) noncompliance with land use regulations, (5) disorderly development, (6) a shortage of land area for public facility development, (7) traffic congestion, (8) poor accessibility to social services, (9) low-level urban safety, (10) air pollution, and (11) noncompliance with traffic rules.

The master plan summarizes issues that are found in the transport sector. With respect to the sustainable urban transport which is an area focused in the master plan, it is noted there are issues related to implementation of the master plan in Kabul City and a need to create a new master plan.

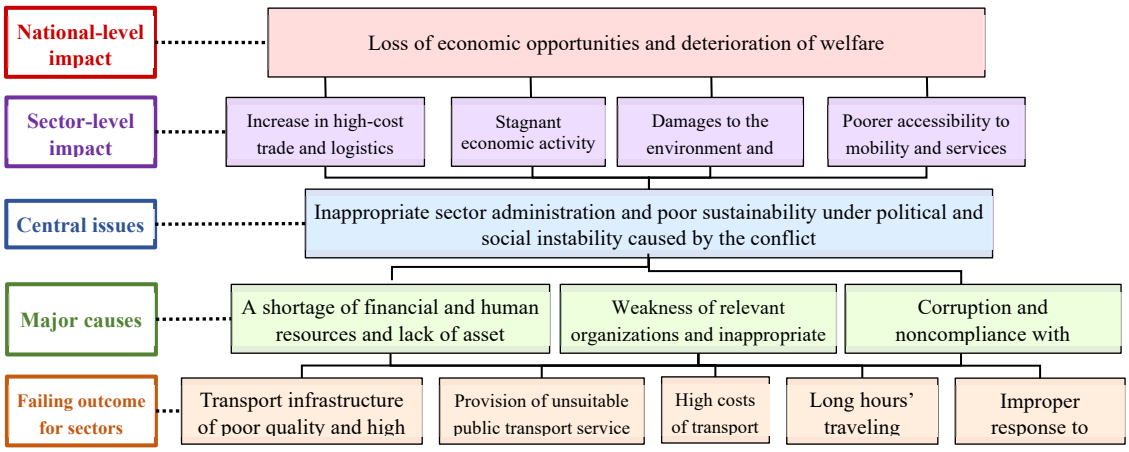


Figure 2.3.1 Issues of the transport sector

The Transport Sector Master Plan proposes to reinvent the sector as shown in the table below.

Table 2.3.2 Issues identified in the Transport Sector Master Plan

Issue	Necessary action	Present status	Action plan
To improve transportation administration and fulfill accountability	• Separation of development and implementation of policies and programs • Promotion of participation of the private sector in financing of development, construction and maintenance of road infrastructure • Introduction of a competitive mechanism to the road maintenance market • Strengthening of a system for road construction procurement	• How to reinvent the sector is now being reviewed by USAID consultants. • A few private contractors are involved in limited road maintenance programs. • Private contractors are engaged in road maintenance works unless it is urgent. • The current procurement system lacks transparency.	• To establish a road agency and a road fund • To create a ministry to lead the road administration as a central body. • To identify areas where domestic companies can actively participate and to build their capacity for being engaged in PPP. • To update the system of pre-qualification: PQ related to registration of private companies, being based on objective standards • To construct a transparent PQ and bidding system

Sustainable road sector	• Establishment of a stable, secure and sustainable financing system for the development of road asset management system and road maintenance • Introduction of regulations on exhaust gas emissions and other environmental preservation means.	• Under a national agricultural program for accessibility of rural areas, a systematic survey and lifecycle cost review have started. • Other actions have not started yet.	• To use the most advanced computer technology to improve the decision-making process for investment and maintenance. • To apply a practical road maintenance strategy that can minimize the lifecycle cost • To select a local organization to be responsible for a road asset management system
Cost recovery	• Application of basic rules to enable full collection of road usage fees to improve economic efficiency, by obligating existing diverse users to pay the cost for their usage. • Selection of financial resources that can improve revenues to meet increasing traffic volume	• A survey has been completed concerning cost recovery and road tolls. • For the cost of road construction, the general revenue sources are used.	• There are options for securing funds to spend on road construction works, such as taxation on vehicle fuels, vehicle registration fees (usually yearly payment) and toll collection. • A proposal for an appropriate solution for technical cooperation was made.
Logistics	• Improvement to realize a seamless network connecting different modes • Introduction of a “one-point” access for simplified administrative procedures for freight information • Establishment of appropriate transit fees and stimulation of international vehicle transit	• Improvement of documentation procedures including creation of guidebooks for shipping brokers as well as enhancement of logistics through corridors development • Although investment in logistics facilities and cooperation to improve customs clearance have been implemented, further improvement is necessary. • It is indispensable to establish fares for international shipping brokers to compete with other corridors.	• To continue to promote transit traffic and trade under the Central Asia Regional Economic Cooperation Program (CAREC)
Sustainable urban transport	• To reduce greenhouse gas emissions through application of a comprehensive approach based on the Urban Transport Plan	• The Kabul City Master Plan has been developed but is yet to be implemented. • The cause of road congestion lies in excessive reliance on passenger car traffic.	• To construct the Kabul ring road • It is desired that a new Master Plan be developed.
Regional economic partnership	• To continue to have the traffic and trade promotion strategy under CAREC	• A total of six CAREC corridors have been currently under development.	• To develop multimode corridors to complement road corridors with railway transport.

Source: Prepared by the Study Team based on the Transport Sector Master Plan.

The amount of investment made by subsector and by urban transport subsector program is shown in Table 2.3.3 below.

Table 2.3.3 Investment amounts made by subsector and by each program of urban transport subsector (2017-2036)

Subsector	Investment amount ($ million)	Percentage (%)
Road	13,000	50.2
Railway	11,176	43.1
Urban transport	853	3.3
Airport	568	2.2
Promotion of trade	300	1.2
Total	25,897	100.0

Program	Total length (km)	Investment amount ($ million)
Kabul ring road	95	142.5
BRT route	100	350.0
Public transport	150	75.0
Transport technology	100	75.0
Intelligent transport		50.0
Social impact mitigation plan		30.0
Public education campaign		20.0
Reserve fund (15%)		110.0
Total		853.5

Source: Transport Sector Master Plan

2.3.3 Afghanistan Green Urban Transport Strategy

Under the leadership of the Executive Office of the President, the Afghanistan Green Urban Transport Strategy was established by the Traffic Technology Center of Kabul University in 2014, in cooperation with the Ministry of Transport and Civil Aviation (currently, the Transport Ministry), the Ministry of Urban Development and Housing (MUDH), the Traffic Police Department of the Ministry of Internal Affairs, the National Environment Protection Agency, and the Ministry of Finance. The strategy proposes to improve the country's transport service to make it (1) affordable, (2) safe, (3) efficient, (4) reliable, (5) environmental-friendly, (6) well-planned and appropriate to the land use, and (7) inclusive of urban cargo transport. In addition, in the strategy, the following enhancement is proposed so that partnerships of relevant organizations could be improved: (8) mechanism to provide efficient service, and (9) buildup of research quality and capacity.

2.3.4 National Priority Programs (NPPs)

The National Priority Programs are established as priority programs to be developed by relevant ministries and agencies for each sectoral area, under the leadership of the Ministry of Finance, after the program goals were established by political leaders and after the development policies were established and managed by the interministerial cabinet meeting. It is assumed that the national budget for the NPP should be drafted and allocated according to the plan and each program should be implemented by each responsible ministry or agency. NPPs are composed of the following 10 components listed in the table below, of which, components (2) and (7) are closely relevant to this study.

Table 2.3.4 Components of National Priority Programs (NPPs)

(1) Development of the private sector	(2) Infrastructure programs	(3) Effective governance	(4) Judicial and court system reform
(5) Citizen's charter	(6) Comprehensive agricultural development	(7) Urban development	(8) Mining industry
(9) Human resources development	(10) Economic empowerment of women		

Source: Prepared by the Study Team

Under U-NPPs, the following objectives have been established (overall objectives, specific objectives and outcome) that are grouped under three pillars:

Overall objective: Cities in Afghanistan are to become the hub of the country's economic growth to reduce poverty and promote employment.

Specific objectives: The government's capability, interorganizational partnership and information are to be built up and enhanced.

Outcome: (1) The environment for the national urban development policies is to be improved and the U-NPPs be implemented in the form of participatory program. (2) Knowledge and data concerning the regional city and strategic district municipalities are to be improved.

The three pillars of U-NPPs are (1) Strengthening Urban Governance and Institutions, (2) Ensuring Adequate Housing and Basic Urban Services to All Citizens, and (3) Harnessing the Urban Economy and Infrastructure. In more detail, the first pillar has six components, while the second pillar has six and the third has five components.

Pillar 1: Strengthening Urban Governance and Institution
Component 1.1: To establish a vision and urban development policies that are common to each level of nation, regions and municipalities
Component 1.2: To improve laws and regulations to a large extent, implement devolution of power and strengthen the rule of law in cities
Component 1.3: To build up the capacity of the Dep. Ministry of Municipality and those involved in urban development
Component 1.4: To formalize and strengthen community-based governance mechanisms
Component 1.5: To empower young people and women in political and economic decision making
Component 1.6: To strengthen urban monitoring, and further accumulate knowledge and data

Pillar 2: Ensuring Adequate Housing and Basic Urban Services to All Citizens
Component 2.1: To promote new affordable social housing
Component 2.2: To upgrade informal settlements
Component 2.3: To undertake urban renewal in the largest five cities
Component 2.4: To establish a national Islamic financing system for housing
Component 2.5: To extend public service and facilities in the neighboring regions
Component 2.6: To improve public space and facilities at the level of neighboring regions

Pillar 3: Harnessing the Urban Economy and Infrastructure
Component 3.1: To reduce urban poverty and strengthen the resilience of urban households
Component 3.2: To strengthen land management and administration in cities
Component 3.3: To establish sustainable and well-balanced transport system, infrastructure and services
Component 3.4: To promote economic agglomeration and urban economic zones
Component 3.5: To strengthen rural-urban linkages and the value chains for export markets

Source: U-NPP

Figure 2.3.2 Three pillars and the components of U-NPPs

It is considered that components particularly related to this survey are urban transport aspects of Component 3.3, Component 1.2, Component 1.3 and Component 1.6. The present status, policies and strategies and outcome for each of these components are shown below.

Table 2.3.5 Details of three pillars and the components of U-NPPs

Component 3.3: To establish sustainable and well-balanced transport system, infrastructure and services	
Present status	Mobility and transport of a city can have an influence on the city's productivity. Roads and traffic system of Kabul City, however, accounts for only 7% of the city's land use. The percentage is too small when compared with 30%, which is thought to be ideal in the world. In Kabul City, a large part of urban roads has not been restored, which hinders both intracity and intercity transport. In Afghanistan, most cities are suffered from problems such as death toll of people, air and noise pollution, health issues caused by traffic congestion and accidents. The number of cars owned per 1,000 citizens was 10 in 2002 but it increased to 35 in 2012. According to a traffic census recently conducted in Kabul City, the traffic volume increased twofold from that of 2009 and commuting between suburban areas and city central has significantly increased, too. Among those who commute within and into Kabul City, 33% of them walk to and from the workplace. Due to a shortage of car parking spaces and noncompliance with parking regulations, pedestrians in the city are often blocked by car traffic. Also, there are not enough buses, mini-buses and shared taxis compared to the increasing urban population and the city has no logistics systems that can efficiently transport cargoes.
Policy	To promote and realize a high-quality public transportation system and a comprehensive transport network that can give considerations to easiness for pedestrians to walk and independence from cars for young people and women.
Strategy	The government improves and implements policies and strategies for mobility of sustainable cities and urban areas to realize environmentally sound, safe and affordable transportation means. Then, the government contributes to an equitable society, gender equality, health, safety, urban resilience and urban-rural linkages by constructing and improving a comprehensive transport system suitable to compact cities.
Outcome	a. A public transportation system is planned and investment is made in BRT, Milliebus, bicycle use, pedestrians' facilities, LRT, etc. b. A plan is developed and land is procured for an international airport near Kabul City (to be developed in 2025 or later). c. Urban logistics are strengthened by developing intercity transportation and traffic nodes to be connected to trade routes. d. Transport plans and land use plans are aggregated. e. Citizen's awareness of transport laws, regulations and administration is deepened and safe, secure and affordable traveling is promoted for young people, people with disability, women and senior citizens. f. Strategic plans for urban areas are made and implemented in major cities and infrastructure projects necessary both in rural and urban areas are planned.

Component 1.2: To improve laws and regulations to a large extent, implement devolution of power and strengthen the rule of law in cities	
Present status	There is redundancy among government organizations at a range of levels in terms of laws, regulations, responsibilities and administrative tasks, which causes unplanned urbanization, inappropriate provision of basic service, poor enforcement and corruption. Legal or regulatory means concerning urban development and governance do not exist or are very obsolete and they cannot meet changes and needs arising in association with urbanization. And therefore, urban development occurs in a chaotic manner and ends up in a waste of resources.
Policy	To widely impose the rule of law, develop a legal and regulatory framework, protect citizens and the private sector and correct problems that are a negative legacy from the past.
Strategy	To consolidate laws and regulations to eliminate any omission. To design and renovate a legal system that functions effectively according to needs, enforcement capability and available funds, so that the law and regulatory system can be widely known, applied, used and complied.

Outcome	a. A city-level local autonomy law and an urban development law are newly established. b. A legal and regulatory housing framework for single-person households and multi-generation households as well as for social housing is developed. c. An evaluation is made to identify a map of illegal frameworks as well as means and actions, based on a review made in the national urban policy dialog. d. The Municipal Advisory Boards are strengthened prior to the municipal election in major cities (Kabul and other major provincial capitals). e. The law on city-level regional government election is enacted and electoral reform and democratic election of mayors are implemented. f. Democratic election for the municipal community development committee is carried out and an ordinance concerning the Gozar Assemblies is applied.

Component 1.3: To build up the capacity of the Dep. Ministry of Municipality and those involved in urban development	
Present status	Municipalities such as city governments are forced to offer and administer their service, while they are being impacted by rapidly increasing urbanization pressure, economic stagnation, increasing unemployment, land grabbing, unstable food supply, attacks from Anti-Government Elements, increasing drug addiction and social exclusion. As administrative and developmental powers concentrate in the central government, municipalities are unable to offer basic urban services, and hence, they provide and offer services using their own revenues. In addition, municipalities cannot expect to obtain support from the government, including financial transfer, debt financing and aid from the central government. Municipalities cannot provide promised services and collect necessary revenues. Municipalities encounter corruption, a shortage of human resources and organizational capability, poor use of independent financial sources, poor infrastructure, noncompliance with accountability, redundant responsibilities and insufficient policy formation. Municipal assets, funds and land within their responsible area are administered by each municipality and particularly, land owned by the municipality and the country are a source of corruption and at risk of sales and grab. Revenues collected per capita by city governments in Afghanistan is extremely small even when compared with that of a country with a similar level of GDP per capita. In Afghanistan, most cities have no basic accounting process, including an accounting system, revenue collection and expenditure management, or if any, the process is quite meager. Municipalities have a poor organizational capability and a very severe shortage of human resources. Because of lower remuneration rates than in the private sector or at international organizations, they have difficulty in employing, retaining and attracting competent persons. It is essential to revise the municipal framework based on an expectation for decentralization for basic service and administration functions.
Polic	The central government moves the responsibility of urban governance and service provision to municipalities aiming at building up capacity to secure internal financial resources, accountability and transparency among municipalities.
Strategy	To adopt a performance-based mechanism to enhance human resources, organizational capability and financial capacity to meet the size and function of the municipality.
Outcome	a. Financial technology skills are improved to establish a systematic capacity building programs targeted at municipal employees and help all cities to establish standard financial management procedures and an Integrated Financial Management System (IFMS). b. Municipal facilities (buildings, device, electricity, public transportation) are secured at each of provincial capitals and strategic district capitals. c. The public servant (tashkeel) system is reviewed and reformed according to the size and function of each provincial capital or strategic district capital. d. Performance-based financing is available from the National Municipal Development Fund (MDF). e. Capacity for municipal administration and governance of women and young people is enhanced. f. Capacity-building programs of the Ministry of Urban Development and Housing are in place to enhance regulatory and governance functions, policy management, collection and monitoring of urban data, etc.
Component 1.6: To strengthen urban monitoring, and further accumulate knowledge and data	

Present status	No census and comprehensive research have been implemented on demographic and social and economic indicators and there are only limited basic knowledge and data on these three. As the result, policies and decisions cannot be made based on evidence and the potential of the municipalities has not been exploited effectively. Provision of urban service and urban governance are impacted negatively with this lack of data on urbanization status, composition and scope of networking and population of the service area. There is also a lack of knowledge on the vulnerables such as women, young people, senior citizens, IDPs and refugees. The Statistics Agency, the Ministry of Urban Development, the Department of Local Administration and Kabul City have not collaborated well for developing a unified strategy due to data gap and the way of data collection, and hence, these organizations work separately in a fragmented manner. There is no organization to verify data submitted by diverse organizations in charge of the urban sector and data collection programs are often repeatedly planned and implemented within a given time period. This resulted in inappropriate urban governance, insufficient performance of accountability and, hence, policies, programs and strategies are developed not being based on evidence. The State of Afghan Cities 2015 report, however, is the first case that three organizations, the Ministry of Urban Development, the Department of Local Administration and Kabul City, have carried out a comprehensive assessment of 34 provincial capitals of Afghanistan. The report presents information on population, housing, land use and municipal financial administration of these 34 capitals, while, a version entitled, "Afghan Future Cities," presents similar data on 5 cities and 28 strategic district capitals. It is desirable that large-scale and regular efforts be made in a similar manner to present baseline data on municipalities.
Policy	The central government adopts an evidence-based approach for urban policy and program development as well as strategic urban development, performs accountability for citizens and enhances transparency to realize effective urban planning and governance.
Strategy	To enhance capability for urban monitoring, research and data collection and try to use such data in decision-making at all levels.
Outcome	a. The Afghan Urban Forum/Conference is held annually, the progress and lessons are shared and a culture of "urban thinking" is created. b. A database, "urban governance information system," is constructed containing data published by multiple relevant organizations and an e-library is set up. c. Indicators concerning cities are updated every three years and published as the State of Afghan Cities. d. A national urban training/research center is established at the Ministry of Urban Development and Housing. e. Establishment and development of education institutions for surveying urban programs, urban programs to be set up by experts and associations/research institutions for engineering and architecture are accelerated. f. Monitoring is carried out by residents and feedback is made at the level of Gozar Assemblies and the Community Development Council (CDC).

Source: U-NPP

2.3.5 National Infrastructure Plan（2017-2021）

Priority projects were set up for infrastructure development and operation/maintenance for the period from 2017 to 2021. Targeted infrastructure includes: (I) Network infrastructure (1. Transport – roads, dry ports, aviation, railways/service) and (2. Communication – telecommunication, IT development, ICT and postal service); (II) Utilities (3. Energy – Renewable, coal, hydrocarbon, pipelines and transmission lines), (4. Water resource – dams for power generation and irrigation, water supply, sewage and rainwater drainage, irrigation and groundwater) and (5. Mineral resource); (III) Urban development and housing (6. Public housing and 7. Private housing); (IV) Public facilities (8. Government facilities), (9. Defence and security), (10. Health), (11. Education), (12. Memorials and parks), (13. Disaster management and response - flood prevention, landslide countermeasures, earthquake and fire control); and (V) Commerce and manufacturing (14. Commerce and processing, logistics and sales).

In these priority projects for transport infrastructure, it is specifically desirable to reduce the transport costs, improve accessibility to domestic/regional markets and social service, create new jobs, promote trade

and logistics, and as a result of these outcomes, promote social integration.

The issues expected to be encountered on the course to develop transport infrastructure include: programs for strategic development along with regular maintenance; build-up of capacity of related organizations (for development and operation/maintenance) and partnership of related organizations; compliance with regulations and recovery of maintenance costs; nurture of highly qualified contractors and development of capacity of the private sector; and improvement of capacity for project implementation and contract management.

Strategies to promote the development of transport infrastructure are expected to include: development of local networking programs and updating of the priority project selection process; securing and enhancement of sustainable development and cost recovery/maintenance cost; promotion of the private sector's entrance into the aviation area including flight operation and maintenance; promotion of PPPs and participation of the private sector in facility development and operation and maintenance; increase in the number of orders for road constructions to be placed to domestic contractors; improvement of project management through human resource development; improvement of procedures, standards and regulations; and higher performance of the transport and logistics sectors through removal of trade barriers, cooperation with surrounding countries and development of logistic facilities. The following are examples of priority projects related to roads:

(1) Salang Tunnel (completed in 2018, $1 billion)
(2) The national ring road's missing link ($100 million)
(3) Access roads to two border administration facilities (there are seven such facilities in total, $150 million)
(4) Maintenance work of national and regional roads ($160 million per year)

Also, priority projects for urban transport include:

(1) Construction of the Kabul ring road
(2) Development of urban BRT routes
(3) Public transport and transport technology
(4) Intelligent transport system (ITS, etc.)
(5) Education to improve compliance with traffic rules and strengthen awareness of traffic safety

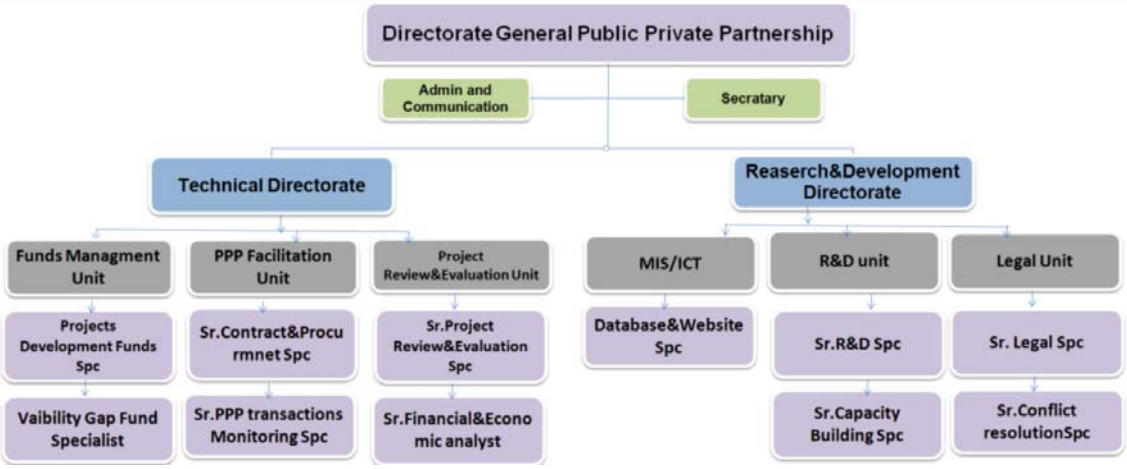
2.4 Investment by the private sector

Of PPPs planned in Afghanistan, projects related to electric power are the largest in number, and in 2020 to 2021, a total of 19 electricity-related PPPs have been registered. Most of these 19 projects are for electric power, housing, parks, markets and movie theaters and there was no PPP related to urban transport in Kabul City.

2.4.1 Summary of PPP system

The overall background and objectives to promote PPPs in Afghanistan is: to use private fund in infrastructure development that needs a huge investment and to vitalize the economy as a whole; to complement the government financing; to operate public facilities efficiently and to provide high quality service; to promote introduction of technologies owned by the private sector; to reduce costs to provide public service; to stabilize the Afghan capital market; and to offer incentives to private companies to encourage participation in PPPs, such as tax benefits.

Since 2014, the Ministry of Finance has been making efforts to develop schemes to implement PPPs for development of infrastructure, etc. And later in 2016, when the PPP Law was enacted, the Central Partnership Authority (CPA), an organization to administer PPPs, was set up. CPA operates under the Executive Order No.1650 and has a role to support the country's economic development, mainly in infrastructure development, through private investment and partnership. It is indispensable that independent public organizations such as CPA should provide and coordinate the private sector's investment information in a transparent manner. And, therefore, it can be said that Afghanistan now has a mechanism to implement PPPs with procedures, similar to the world's standard.



Source: Central Partnership Authority (CPA), Ministry of Finance Afghanistan

Figure 2.4.1 Organizational structure of CPA

2.4.2 The role of CPA

CPA has the authority specified under Article 13 of the PPP Law. Major roles to be played by CPA are as follows:

- To establish standardized forms, rules and various guidelines with an aim at implementing PPPs smoothly in public-private partnership according to the PPP Law
- To establish a method to review the proposed PPP and standards for that purpose, to offer advise to the Economic Committee, to prioritize projects and to develop action plans up to the point of project implementation
- To carry out actual reviews on the proposed PPP (strategy, economic impact, financial conditions, value for money, risk management, lawfulness and due consideration for the environment and the society) and to organize a process to hear from concerned organizations and stakeholders including the Economic Committee
- To implement preparation and registration processes necessary for administrating the PPP
- To coordinate with concerned organizations and receive advice
- To offer technical support to the PPP owner after the project is approved, including how to establish a specified company
- To review the evaluation made on feasibility study, bidding documents, contracts, etc.
- To offer advice to organizations participating in the PPP or on how to enhance relationship of relevant companies
- To manage matters related to fund procurement for the PPP
- To develop policies for the use of IT in the PPP and to carry out necessary works (such as compilation of database)
- To build up the capacity for specified areas related to the PPP and to develop relevant training programs
- To prepare annual reports to present information on the PPP in an organized way
- To carry out monitoring processes of bidding management and implementation contract
- To carry out other necessary and relevant activities

Chapter 3 The current urban transportation situation in the Kabul Metropolitan Area

3.1 Definition of Kabul Metropolitan Area

In 2016, when JICA was studying the new Dehsabz-Barikab urban development plan, the principal entity that was to implement the development, the Dehsabz-Barikab City Development Authority (DCDA), was reorganized as the Capital Region Independent Development Authority (CRIDA). As such, CRIDA was defined as the organization with jurisdiction over development in that region. The area under its jurisdiction was expanded to an area of 7,735 km^2, including parts of Logar, Parwan, Rapisa and Wardak provinces. Charkar, Mamud-i-Raqi, Sarobi, Maidan Shahr, and Pul-e Alam can be positioned as satellite cities outside Kabul's 22 central districts.

Actually, however, these satellite cities are merely designated as special economic areas, and with the exception of the village of Charkar, they lack urban functions.

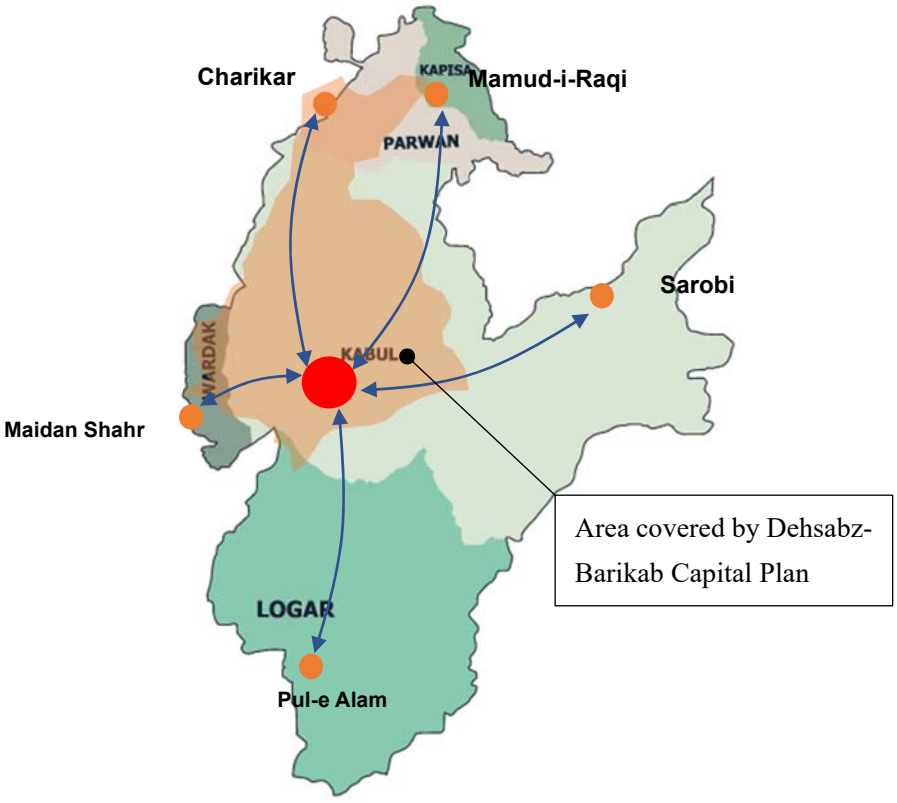


Figure 3.1.1 Definition of Kabul Metropolitan Area

3.2 Urban transportation situation and status of maintenance in the Kabul Metropolitan Area

Based on existing materials, the urban transportation situation and infrastructure maintenance is summarized below.

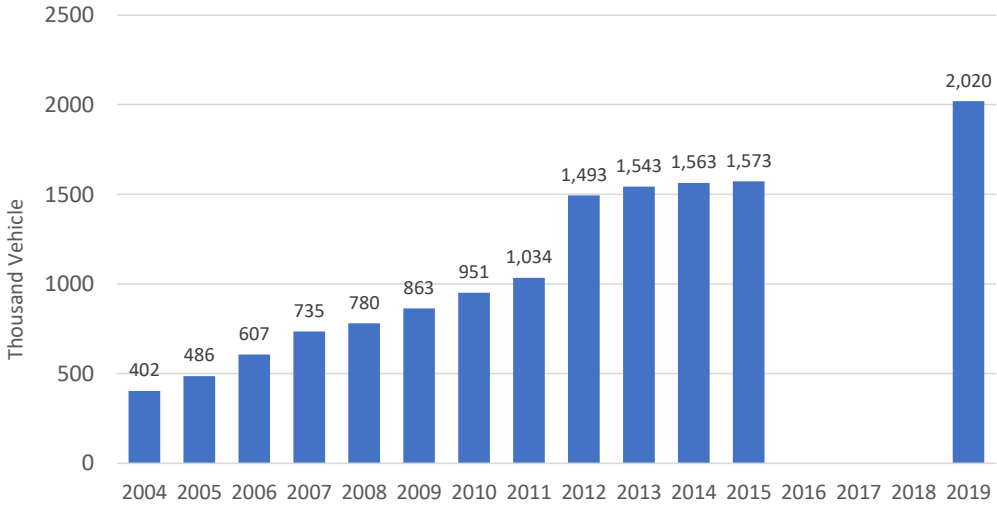
Table 3.2.1 Material gathered on status of transportation in Kabul Municipality

Item	Content	Reference materials
Number of registered vehicles	No. of registered vehicles in Afghanistan	Afghanistan Statistical Yearbook
Road construction/maintenance situation	Current road network; numbers of lanes; pavement condition; future road networks	JICA M/P, BRT M/P Road Technical Cooperation Project for Road Management, GIS data
Transport bottleneck locations	Traffic volume for each transportation mode, each type of vehicle; changes in traffic volumes by time at intersections; volume of traffic passing through Kabul City and environs	JICA M/P, UN Habitat Report, BRT M/P
Bridge construction/maintenance status	Locations, structures, bridge-building periods	Technical Cooperation Project materials for Road Management
Transportation management	Locations of signals at intersections; passage regulations	Technical Cooperation Project materials for Road Management
Persons trip survey	Volume of trips generated per day; purposes; means of transport; changes with time, etc.	JICA M/P
Public transportation situation; shipment volumes; numbers of users	Types of public transportation, numbers of vehicles, routes; numbers of users	JICA M/P, BRT M/P

Source: JICA Study Team

3.2.1 Number of registered vehicles

The number of vehicles in Afghanistan has sharply increased. In the fifteen years from 2004 to 2019, the number of registered vehicles rose by a factor of five — an average increase of 11.4% per year. In particular, the number of passenger vehicles, including privately owned bicycles and rickshaws rose markedly. The rate of growth in the number of buses was the lowest.



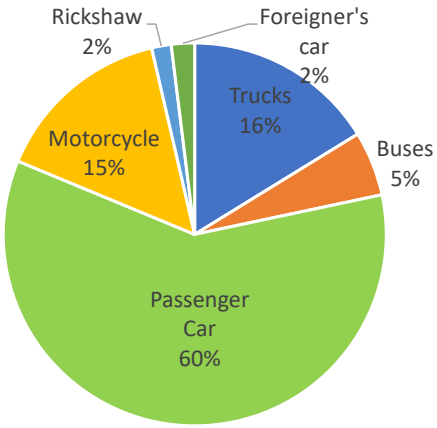
Source: Afghanistan Statistical Yearbook

Figure 3.2.1 Changes in the number of registered vehicles in Afghanistan

Table 3.2.2 Rate of growth for each vehicle type

Type	Trucks	Bus	Passenger car	Motor-cycle	Rickshaw	Foreigner's car	Total
2004	83,374	40,590	197,449	65,430	3,342	12,237	402,409
2019	327,446	110,190	1,203,600	305,521	33,276	39,588	2,019,621
Rate of growth	9.5%	6.9%	12.8%	10.8%	16.6%	8.1%	11.4%

Source: Afghanistan Statistical Yearbook

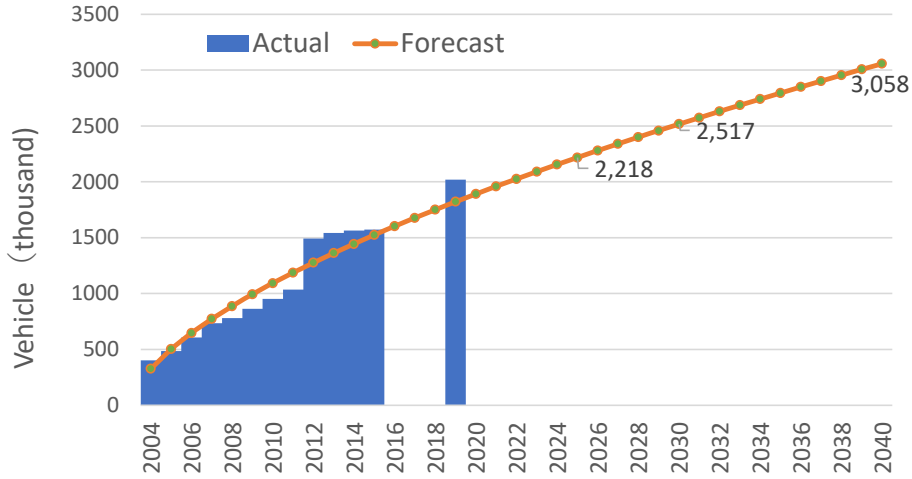


Source: Afghanistan Statistical Yearbook

Figure 3.2.2 Composition of registered vehicles in Afghanistan

3.2.2 Projected numbers of registered vehicles

In Afghanistan, this type of growth in numbers of registered vehicles has been driven by economic and population growths. A similar trend, with even greater growth rate, is expected for the future. Provisionally, a simple projection of the current trend indicates that approximately 2.2 million vehicles will be in use in 2025, 2.5 million in 2030, and 3.0 million in 2040.



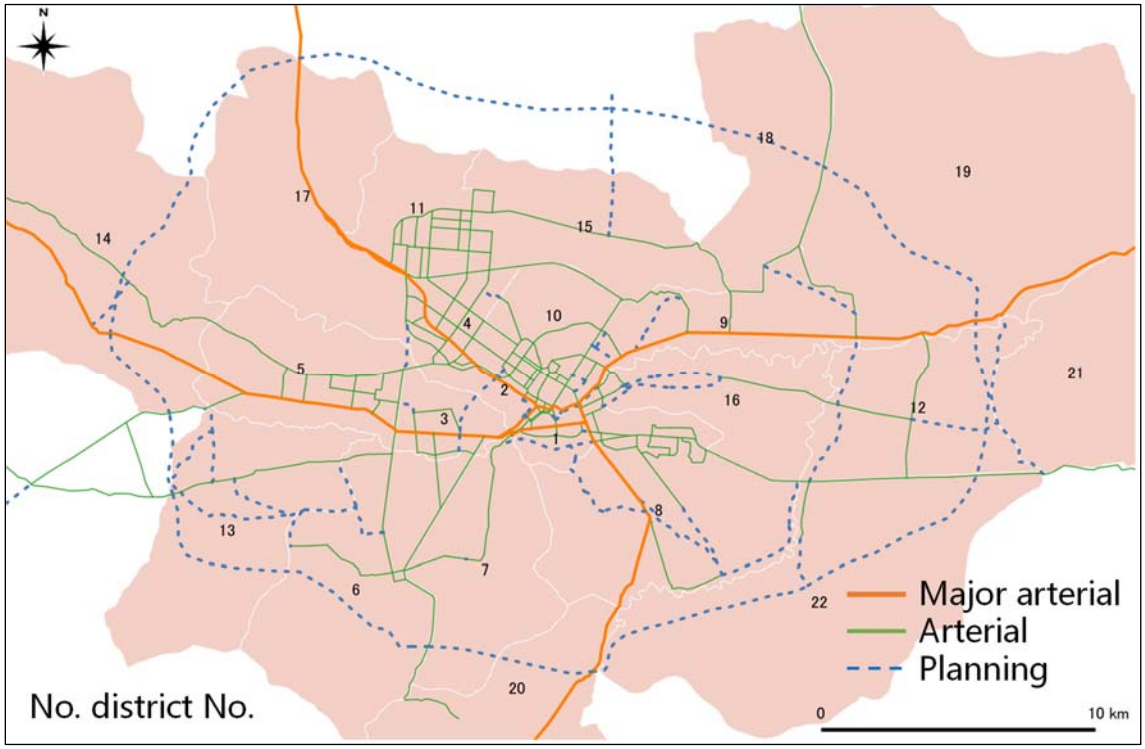
Source: Prepared by the Study Team

Figure 3.2.3 Forecast of number of registered vehicles in Afghanistan

3.2.3 Status of road network in Kabul Municipality

The network of trunk roads in all 22 districts of Kabul City (not including district roads) is indicated below. The trunk roads in the city are categorized as major arterial roads and arterial roads, extending 105 km and 402 km, respectively, making 507 km in total.

An additional road network of about 188 km is planned, most of which will be the Kabul Outer Ring Road.



Source: JICA Study Team

Figure 3.2.4 Road network in Kabul Municipality

3.2.4 Road traffic situation

In this study, a survey on the actual traffic condition was conducted at three locations on trunk roads inside Kabul City, and at six locations on roads at the boundaries with suburbs. The content of the transportation study will be presented in detail in Chapter 4. The observations made in this survey indicate that the volume of traffic greatly exceeds capacity at many locations on the trunk roads in Kabul City.

Figure 3.2.5 Traffic jam in Kabul Municipality

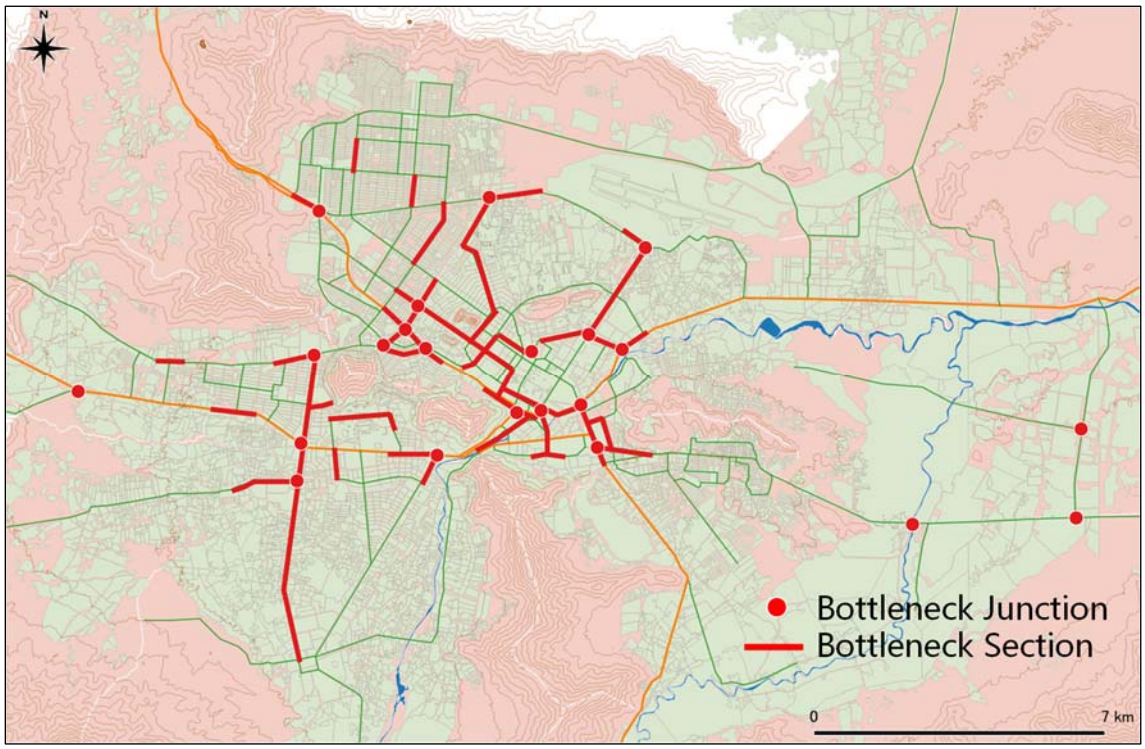
3.2.5 Major bottlenecks

The locations of traffic bottlenecks in Kabul City (intersections and on roads) were identified through an interview conducted in Kabul. The locations found in the current survey were added to the bottleneck locations identified by the study which was part of the Technical Cooperation Project for Road Management.

Twenty bottleneck sections were identified at intersections in Kabul City, with traffic jam occurrences, extending over 50 km of the city roads. The length of bottlenecks in the city road network accounts for about 12% of the total length of the network.

Along with the clear structural problem in which the volume of traffic exceeds the capacity of the roads, other causes of the traffic jams, which are related to road management, include illegal parking, buses stopping to allow passengers to get on and off, inappropriate traffic signals, vehicles blocking traffic when

making left turns, short distances between intersections, bad manners on the part of pedestrians and drivers, intersections without signals, insufficient skills on the part of traffic management employees, and misalignment or mismatches in numbers of traffic lanes before and after intersections. In addition, the traffic blockages caused by these road conditions inevitably lead to security problems.



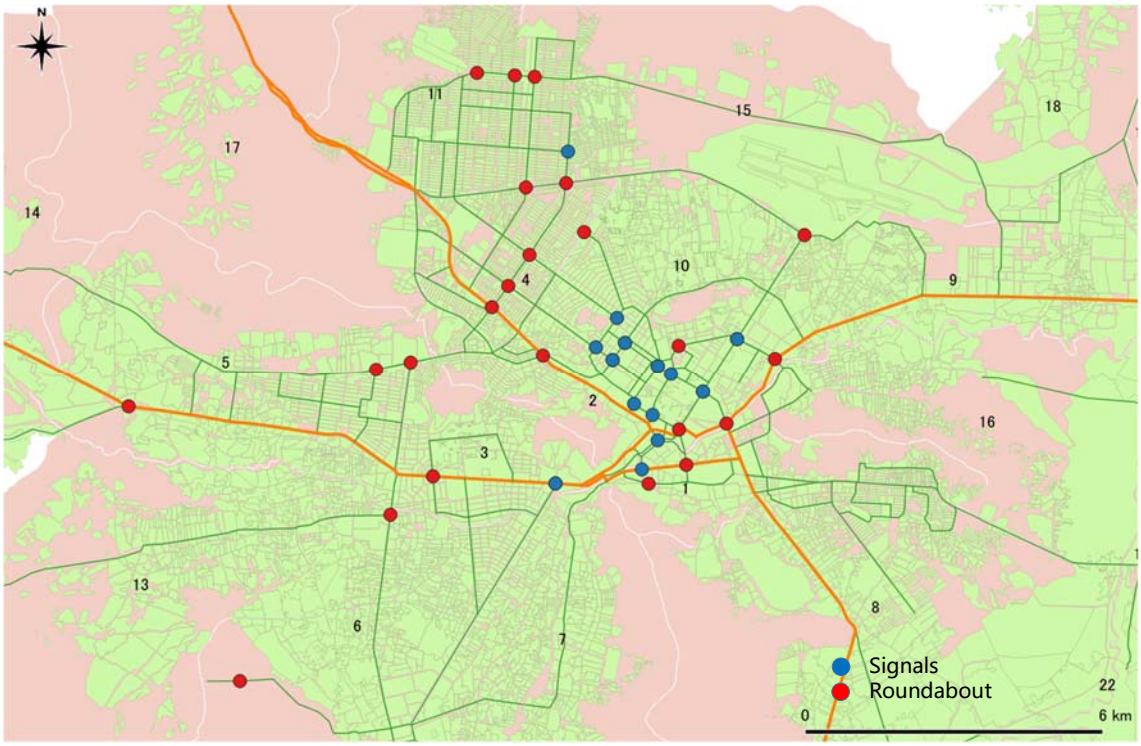
Source: JICA Study Team based on hearing for Kabul Municipality

Figure 3.2.6 Locations of bottlenecks on roads in Kabul Municipality

3.2.6 Traffic management situation

(1) Intersections and signals

Almost no traffic management is being implemented in Kabul City. Although traffic signals have been installed at several intersections in the central part of the city, almost none of them are functioning. Roundabouts exist at many city intersections, but along with road improvement work, etc. some of them are being changed to the form of regular at-grade intersections.

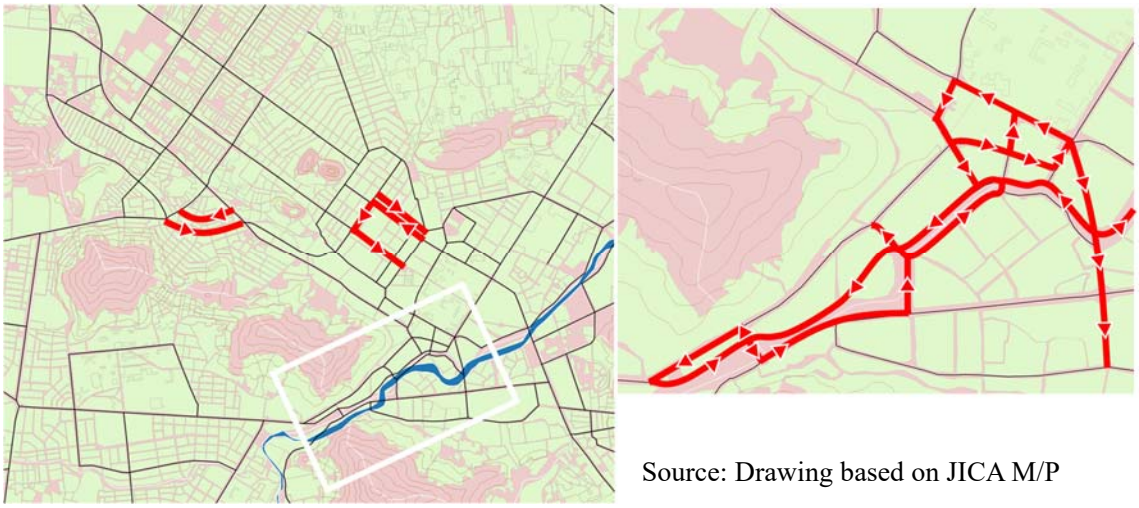


Source: JICA M/P and hearing for Kabul Municipality

Figure 3.2.7 Situation of Kabul Municipality intersections

(2) Traffic control

One-way traffic is set up in three districts in the central part of the city. Large-scale traffic regulation is conducted in the area along Kabul River near the central part of the city, but traffic operations are extremely complicated, and the effects of this effort are not apparent. There is still a constant traffic jam, which is experienced throughout the day.



Source: Drawing based on JICA M/P

Figure 3.2.8 One-way traffic roads in central Kabul

3.3 Status of public transportation

3.3.1 Summary

Public transportation service in Afghanistan is mainly provided by buses. The purpose of public

transportation services is to provide reliable, safe and affordable mobility for citizens. Along with the lack of development of public transportation, the widespread use of automobiles that has accompanied explosive population growth, particularly in the central parts of the capital city of Kabul, has led to the following types of grave social problems:

- Time required for people to move around in the city has become significantly longer
- Immense pollution of the atmosphere
- The cost of moving from one place to another has become a great burden on citizens
- Unbearable traffic jams and drop in safety
- Reduced spaces for urban life
- Urban administration has become very inefficient

According to materials provided by the Central Planning Bureau, the population of Kabul was approximately five million in 2018, and the number of automobiles in use has grown to approximately 1.5 million.

Although it is well understood, from the point of view of both energy efficiency (energy consumed per individual passenger) and the need to reduce emissions causing global warming, public transportation is superior to automobiles, the relative convenience of using an automobile has led to a steady rise in the use of private cars. Generally, for every large bus that has been introduced, sixty automobiles have come into use. In particular, public transportation has not progressed at all in areas where the population density is low. This is due to lack of profitability public transportation services expected in such areas.

To eliminate the public transportation problems in Kabul City just described above, plans are underway for the introduction of a bus rapid transit (BRT) system by the Urban Development Ministry and other agencies. Although there is a Master Plan for this, no detailed study has been done, which makes moving to the implementation phase difficult.

Rather than construction of a public transportation system, emphasis has been placed on new road construction and expansion of existing roads at both national and city levels. This is not linked to solving the problems faced by citizens commuting to work or students traveling to school. Under the leadership of Abdullah Abdullah, Chairman of the Ruling Council, a “Basic Plan for Transport 1090/8” has been drafted to improve public transportation, but without any tangible result.

3.3.2 Public transportation situation

Public transportation services in Afghanistan, including Kabul City, are very much at a rudimentary stage. While insufficient, the Milli Bus Enterprise, was established as a national bus service fifty years ago to handle all bus services. Nevertheless, it has internal organizational and operational problems. The issues Milli Bus faces as a public company include limited stock of vehicles and depots it owns. There are also problems related to company management’s jurisdiction. All this has resulted in the company failing to provide services that fully meet citizens’ needs.

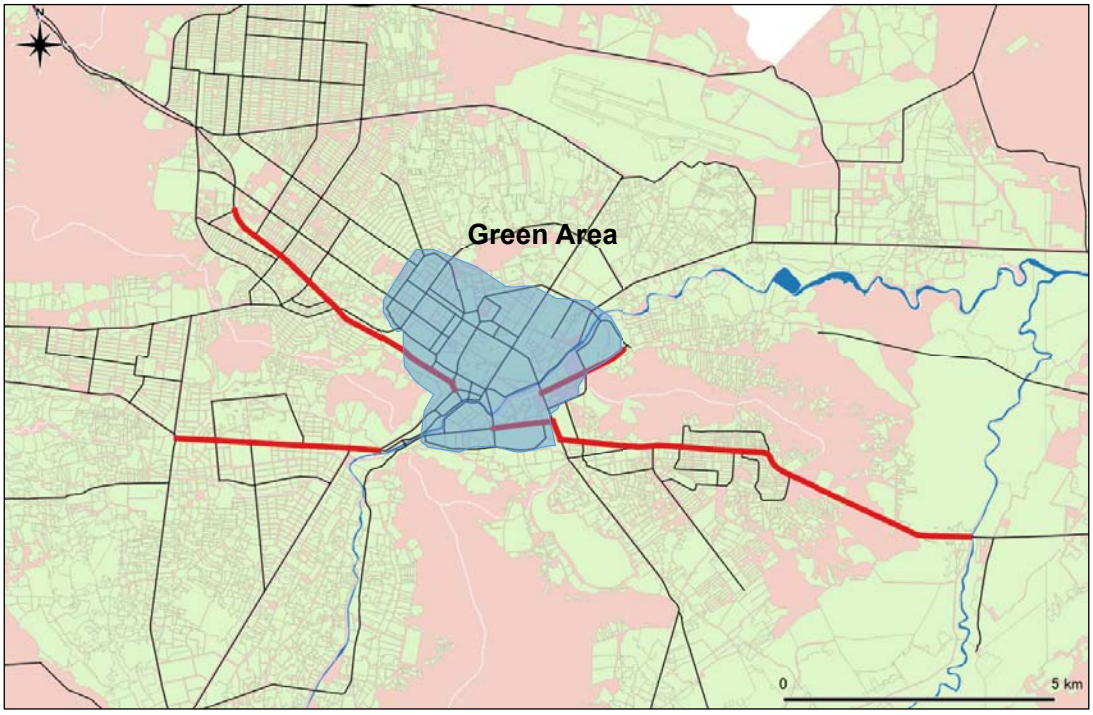
For this reason, in addition to Milli Bus Enterprise, a number of private bus companies are now in operation — some are legally established, and some are not. These private bus companies are not meeting demand for public transportation either, and their services is poor. Passengers have to wait a long time for service. This and other problems lead to a general situation in which commuters and students turn to their own autos and to taxis, which only adds to the severe road congestion.

3.3.3 Management by national bus operator

The national bus company (Milli Bus Enterprise) is the only public transportation operator managed by the government. However, it is not efficiently organized, its employees lack skills, and corruption is rampant. Proper organizational support is not provided, and it is not appropriately managed.

Milli Bus Enterprise has about 880 employees (including bus drivers and fare collectors). Among these, about 500 employees work in Kabul, and the rest work in other provinces. The company's basic organization structure was established some thirty years ago. In those days it operated about 1,000 buses. Currently the number of buses in service has fallen to 200, 75 of which are operated in Kabul, where service is provided on only four lines (for a total length of about 20 km). Despite this, the number of employees remains virtually unchanged with a workforce of about 500. This mismatch between the service provided and the number of employees is one of the company's biggest organizational problems. For this reason, organizational improvements are an urgent task for Milli Bus Enterprise, and at the same time, it is necessary to raise the level of employees' technical skills. Currently, a major issue is the lack of a profitable operating structure caused by too few bus lines, which leads to a very low level of payment for the large number of employees.

In addition, it has been pointed out that the average age of the company's employees is very high, and it has become necessary to replenish the workforce with younger employees. In solving this problem, it is essential that human resources with relatively high levels of technical knowledge be recruited.



Source: JICA Study team based on hearing for Milli Bus

Figure 3.3.1 Milli Bus lines in operation

3.3.4 Buses and related infrastructure facilities

Milli Bus Enterprise owns about 200 large buses and about 1,000 minibuses in service. Actually, many of the vehicles are not properly maintained and therefore cannot be operated as required. As many as 340 vehicles currently inoperable have only minor problems that can be easily repaired with a small expenditure of funds. However, the main problem is that the lack of a properly equipped maintenance system prevents repairs from being made.

3.3.5 The operating system

The old-style management system used at Milli Bus Enterprise remains unchanged, and the monitoring of bus operations is ineffective. The service management system is far from the ones that could ensure that buses run on time — according to a schedule. In Kabul, in particular, there are no fixed bus stops, and every day passengers get on and off the buses wherever they can. In addition, the buses often will not take off until they become full of passengers. This type of service is one more reason why the public avoid using the public transportation.

The system used to collect bus fares is one in which cash is directly paid to an employee, which leads to a breakdown in the relationship between fare collection and operation and maintenance costs. In other words, operating and maintenance costs unavoidably remain rigidly in place as fare collections continue to dwindle.

3.3.6 The financial situation

For the sake of financial stability in a bus business, it is very important to have a clear understanding of the balance between revenue from fare collections and operating and maintenance costs. To achieve financial stability and operating efficiency, in recent years cities throughout the world have used information technology to upgrade systems used to monitor fare collections and operating and maintenance costs. Milli Bus continues to use a truly old, outmoded system — one in which business payments are made in daily installments.

3.3.7 Private bus operators and taxis

As indicated above, when public transportation services provided by the government are insufficient, private bus operators play an important role. According to Afghanistan's Transport Ministry, seventeen private bus operators and their combinations are operating in Kabul City, with approximately 2,500 buses (mainly mini-buses or small-scale buses equivalent in size). In addition, there are seven private taxi businesses operating approximately 4,100 registered vehicles. In the private bus business, aside from individual operators, operating conditions are very difficult. Life-Star Company and Kabul-Cab are examples of companies that have left the business to concentrate on taxi operations.

According to a technical director of the public bus company, the systems and organizations providing support for private bus operators in Kabul City are insufficient, and surviving in this operating environment is very difficult. In addition, passenger cars are used for jitney-type taxi operations in the city.

Most of the vehicles used by individual bus operators are boxcars with a capacity of about fifteen passengers. Mini-buses operate in all the city's districts (including the old 54 lines, once covered by the public bus system). Jitney-type taxis cover what is called the "Green Area," in the central part of the city, a relatively safe area. The fares for either type of service range from 20 to 40 afghanis (about 27 to 54 yen), and they are easy to use. However, their small size makes them inefficient. Passengers get on and off these vehicles all over the city, which has an adverse effect on other types of transportation using the same roads.

The following types of operation and management issues pertain to private buses and taxis and their combinations:

- No sense of unity in private bus operations
- Insufficient regulation of private bus management and operation; no plan for operating lines
- Insufficient parking spaces for buses in Kabul City
- Lack of clarity in government contracts and government authorizations for private bus operations
- Lack of system for regular reports from private operators

- Gap between the rising cost of operating, and management and maintenance and decreasing revenue from fares
- Lack of clarity in definition of roles and burdens to be borne by government bus operations and private bus operations
- As a public transport service, unreliability and low operating efficiency of vehicles (in terms of form and capacity)

3.3.8 Car sharing services

Among jitney-type taxi services, on-line services have emerged. Companies such as Fast Taxi and BBR have begun providing services in which automobiles are reserved and dispatched to serve customers. Expansion of these services remains limited, however, because the number of smartphone users is small, communications environment is unstable, and traffic jams delay the arrivals of reserved cars.


Source: Life-star Co. and Fast Taxi home pages

Figure 3.3.2 Fast Taxi on-line services

3.4 System of laws and bylaws for Kabul Metropolitan Area

The following types of laws and bylaws exist to regulate traffic in the capital region in Kabul City.

3.4.1 Road Traffic Management Law (RTML)

This law covers drivers' licenses and required procedures and documents. It also has provisions related to traffic management, traffic safety, insurance, and such matters as indemnities and damage claims.

3.4.2 On-street and off-Street parking bylaw

This bylaw includes ordinances regulating parking in Kabul City, covering on-street parking and the use of parking facilities. It is now at the stage of approval procedures.

3.4.3 Traffic warden rules and procedures

The parking ordinances referred above include rules and procedures pertaining to traffic control in Kabul City. They are now under consideration, and details have not been set.

3.4.4 Sections pertaining to laws of municipalities

Among the laws and ordinances pertaining to Kabul City are Chapter 22 and Chapter 23, which include regulations for arterial roads (main trunk roads) and urban traffic controls.

3.4.5 Public transportation framework

Working with the Transport Ministry, Kabul City, and the CRIDA, the Senior Transport Advisor for the President developed a framework for public transportation, which was informally approved by the President. It sets forth policies for the public bus system and private operators. Formal approval has not been given, however, due to many opposing opinions received from bus operators and related organizations. The subjects

covered include the following:

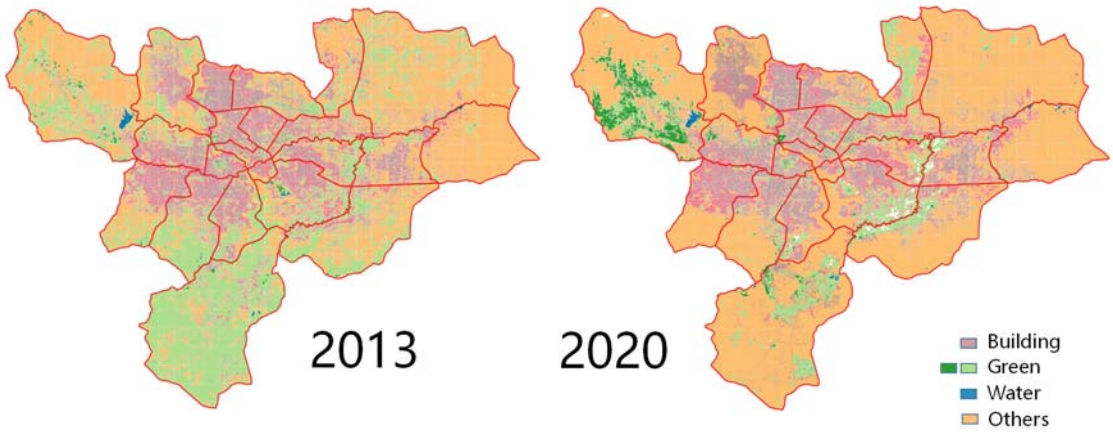
- Outline of a public transportation framework
- Desirable public transportation network for Kabul City
- Bus vehicles
- Plan for infrastructure construction for public bus transportation
- Policy on fares and a collection system
- Operation management system
- Organizational framework
- Procedures for road map development
- Budget measures
- Proposals

The framework draft includes proposals for major reforms in transport-related organizations. Many adjustments cutting across organizations are proposed, along with a committee that would guide their implementation. Policy proposals are advanced for all public bus transportation along with a bureau within the Afghanistan Ministry of Transport for monitoring. It also includes other measures such as organizational changes aimed at enhancing the independence of the public bus system (Millibus); budget measures and a committee for control of approvals pertaining to all public transportation in Kabul City; and establishment of a committee to promote and monitor public transportation projects.

3.5 Urban sprawl condition

Great changes related to urban expansion and land utilization have been occurring due to the dramatic flow of people year after year into Kabul. Housing development is ongoing in existing urban areas, and population density is increasing along with a great urban sprawl extending into the areas in the northern, southwestern, and eastern districts. A M/P for a new city was drawn up in 2008. Geographical limitations exist because the area is surrounded by mountains. To cope with this, the concept adopted is for development of a new urban area in the Dehsabz-Barikab region north of the existing urban area. The concept is for great expansion of urban districts in many areas, but for now, progress based on the main plan has been suspended.

Using satellite images for data analysis, Figure 3.5.1 illustrates the situation as of 2013 and the type of changes in land utilization conceived for 2020 are shown for comparison. The basic ideas for expansion of urban areas in the northern, southwestern, and eastern districts can be understood.



Source: JICA Study Team

Figure 3.5.1 Urban expansion in Kabul Municipality

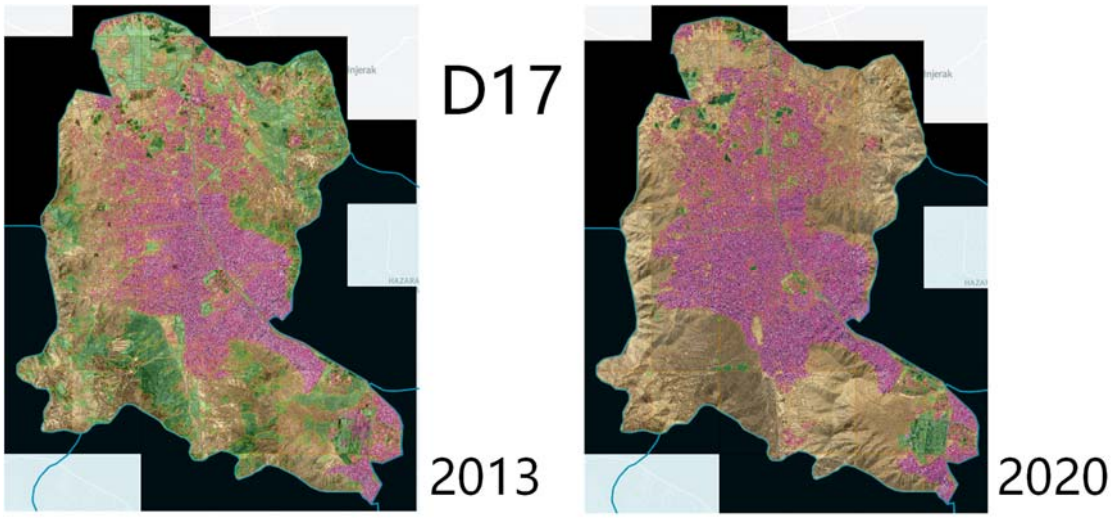
A detailed look at the central part of the city provides an idea of how the area to be used for building construction will decrease; in the suburban areas, however, particularly in Districts 17, 20 and 21 building floor spaces are more than double in size. The expansion (approximately 20%) of the urban area throughout the 22 District can be seen, along with a decrease in green spaces of about 50%.

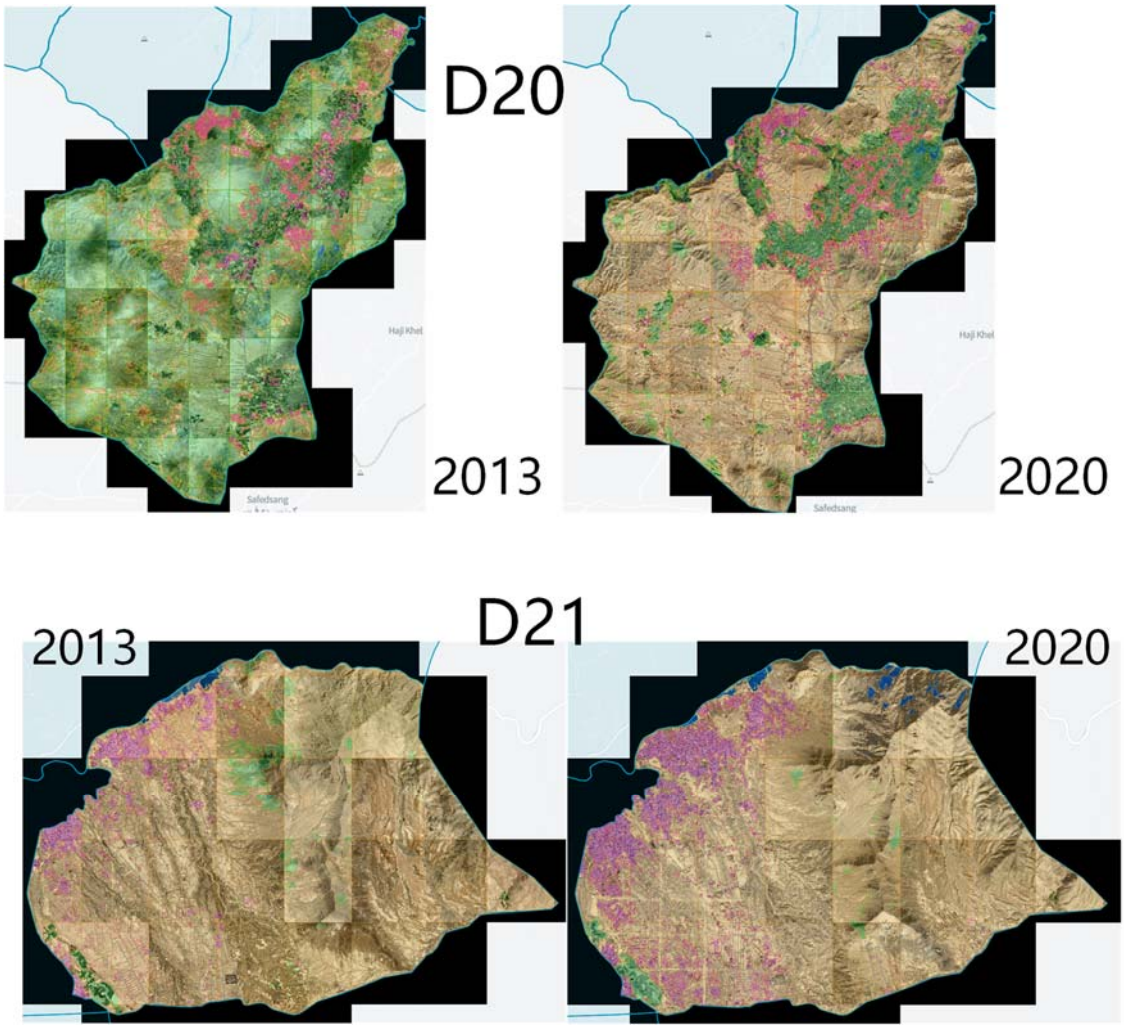
Table 3.5.1 Changes in land use in each district

(km2) (%)

	2013					2020					Change Rate			
District	Building	Green	Roads	Others	Total	Building	Green	Roads	Others	Total	Building	Green	Roads	Others
1	1.95347	0.55779	0.59125	1.57749	4.68	1.42378	0.3924	0.56125	2.30257	4.68	-27%	-30%	-5%	46%
2	2.4298	1.19571	2.25986	0.88463	6.77	1.90305	0.94584	2.18364	1.73747	6.77	-22%	-21%	-3%	96%
3	4.03425	1.55312	1.75554	1.88709	9.23	3.39113	1.37038	1.79422	2.67427	9.23	-16%	-12%	2%	42%
4	5.44746	0.86734	3.32837	1.99683	11.64	4.5559	0.80073	3.78512	2.49825	11.64	-16%	-8%	14%	25%
5	10.39211	5.25407	5.02305	8.59077	29.26	11.82242	2.66855	5.69031	9.07872	29.26	14%	-49%	13%	6%
6	9.6158	21.6865	5.29617	12.54153	49.14	9.37328	4.28339	5.97372	29.50961	49.14	-3%	-80%	13%	135%
7	10.08148	10.53619	3.95915	7.98318	32.56	10.51579	2.84792	4.90259	14.2937	32.56	4%	-73%	24%	79%
8	15.69149	16.83435	5.2375	10.70666	48.47	13.46432	11.87306	5.66458	17.46804	48.47	-14%	-29%	8%	63%
9	7.43567	3.81354	4.18073	9.04006	24.47	7.88784	3.79505	3.72446	9.06265	24.47	6%	0%	-11%	0%
10	6.6553	0.78718	2.98073	2.57679	13	6.26363	0.74955	3.05538	2.93144	13	-6%	-5%	3%	14%
11	8.20474	1.18455	4.07618	3.91453	17.38	8.44419	0.35527	4.22244	4.3581	17.38	3%	-70%	4%	11%
12	8.66467	5.77357	5.08504	15.29672	34.82	11.17259	3.62319	5.57141	14.45281	34.82	29%	-37%	10%	-6%
13	15.48296	9.95168	4.34663	16.89873	46.68	19.40432	0.83972	4.74924	21.68672	46.68	25%	-92%	9%	28%
14	2.54021	37.20896	3.56208	84.35875	127.67	2.93731	36.62578	4.46556	83.64135	127.67	16%	-2%	25%	-1%
15	7.43818	5.26044	5.83481	13.60657	32.14	9.01255	3.91246	5.85611	13.35888	32.14	21%	-26%	0%	-2%
16	7.92866	7.53685	3.34757	6.36692	25.18	9.17436	4.6964	3.15628	8.15296	25.18	16%	-38%	-6%	28%
17	10.45987	13.66796	5.86686	26.03531	56.03	25.55983	4.081	15.27716	11.11201	56.03	144%	-70%	160%	-57%
18	5.2899	6.04521	2.22682	20.38807	33.95	4.35322	10.72809	2.16265	16.70604	33.95	-18%	77%	-3%	-18%
19	2.46603	27.92569	5.67178	105.4765	141.54	3.53625	3.02878	5.19219	129.78278	141.54	43%	-89%	-8%	23%
20	3.80018	109.39667	4.75917	25.74398	143.7	10.24616	47.84534	10.34296	75.26554	143.7	170%	-56%	117%	192%
21	2.4539	1.9862	1.91635	56.93355	63.29	5.64694	0.96107	2.19851	54.48348	63.29	130%	-52%	15%	-4%
22	5.59284	29.88432	3.37067	40.24217	79.09	7.33955	10.56444	3.97938	57.20663	79.09	31%	-65%	18%	42%
All	154.05897	318.90789	84.67631	473.04683	1030.69	187.42841	156.98841	104.50916	581.76402	1030.69	22%	-51%	23%	23%

Source: JICA Study Team





Source: JICA Study Team

Figure 3.5.2 Major districts with large-scaled urban sprawl on land use

3.6 Master Plan related to transportation in Kabul Metropolitan Area

The higher-level plans for urban transportation infrastructure in Kabul City include the JICA M/P supported by JICA, and the KUDF implemented by MUDL. As shown in Table 3.6.1, while the sense of level differs, both are based on a preliminary plan and a cityscape design. In addition, when concrete plans for lines are compared, the contents are inconsistent in many areas, and this would be a problem in actually implementing the plans. In the technical cooperation project for road management now under way, the evaluation of JICA M/P and KUDF by Kabul City employees was verified. It was said that JICA /MP needs to be updated; basically it is a continuation of a framework being studied, including ideas for new urban development. It was drawn up over ten years ago. On the other hand, the main parts of KUDF are designs providing images of redevelopment of districts and areas along corridors. It has little in the way of actual plans or blueprints. Many think that using it for practical work would be difficult. It is basically understood that this framework is to be followed because it has already been approved by the President, but the extent the plans it contains should be adhered to will have to be confirmed in practice.

Table 3.6.1 Comparison of contents of JICA M/P and KUDF

Items		JICAMP	KUDF
Outline	When created	2011	2018
	Area covered	Existing urban districts (all 22 districts)	Existing urban districts (all 22 districts)
	Plan level	Outline design (drawings and quantities)	Landscape design
	Survey of actual traffic situation	Conduct home visits and survey of transportation	Almost nothing implemented (other report utilized)
	Cost estimates	Implemented	Almost none

Source: JICA Study Team

The following issues and challenges pertain to the KUDF:

- Limitation of the area to existing urban districts, which is not consistent with the establishment of the CRIDA.
- Meeting the need for concepts and images of the types of future cities that the citizens expecting; establishing concrete numerical targets for such problems as population density (allocation of population); promoting conceptual thinking to make up for a lack of ideas; and a need to establish connections between the future images and the proposals and basic plans included in the KUDF.
- Lack of a proper theoretical framework (infrastructure plan) for transportation consistent with the industries in the area and the configuration of the city.
- No indications of ICT or practical applications of digital elements; difficulty in converting to smart functioning; sudden acceleration due to corona influence. Data is accumulated (integrated) and analyzed; compatibility of transportation services and infrastructure management is achieved; for now, further study is needed.

Basically, to continue with the KUDF plan, a comprehensive plan must be created to deal with area expansion, and Master Plan targets. Concrete ideas are needed for a desirable industrial structure. These must be based on an analysis of the latest study of transportation needs and a plan that can be utilized in actual work.

For BRT development, the KUDF, which was created by MUDL, and the BRT M/P, which was created by Kabul City, exist. The BRT M/P generally uses detailed technical studies. On the other hand, the KUDF is mainly based on planning for transit lines and actual work, but it does not appear to use detailed studies of demand or evaluation of economic conditions. The KUDF was created right after the BRT M/P, and although some of the routes have been revised, for the most part, it follows the BRT M/P when it comes to routes and construction priorities. In contrast, BRT M/P stated higher user demand. This indicates need to verify the source of the difference of the demand in the KUDF; when doing this, a recent traffic survey and an updated analysis of demand should be used. In this study, transportation demand estimates are updated, and demand is considered on that basis.

Table 3.6.2 Comparison of results between KUDF and BRT M/P

BRT M/P	KUDF
7 lines (1 line without exclusive tracks; total length 221 km)	7 lines, total length 214 km
Construction period: 2025 - 2030	Not specifically stated; until about 2028
User demand: 930,000 per day in 2030 (total for 7 lines)	User demand: 400,000 – 500,000/day by around 2028 (max. number of lines)
Route drawings are nearly the same (some parts differ)	

Source: BRT M/P and KUDF

For information on plans other than the two outlined above, see the following chapters which provide

explanations of urban transportation infrastructure plans being implemented or considered for KM by Kabul City or other donors.

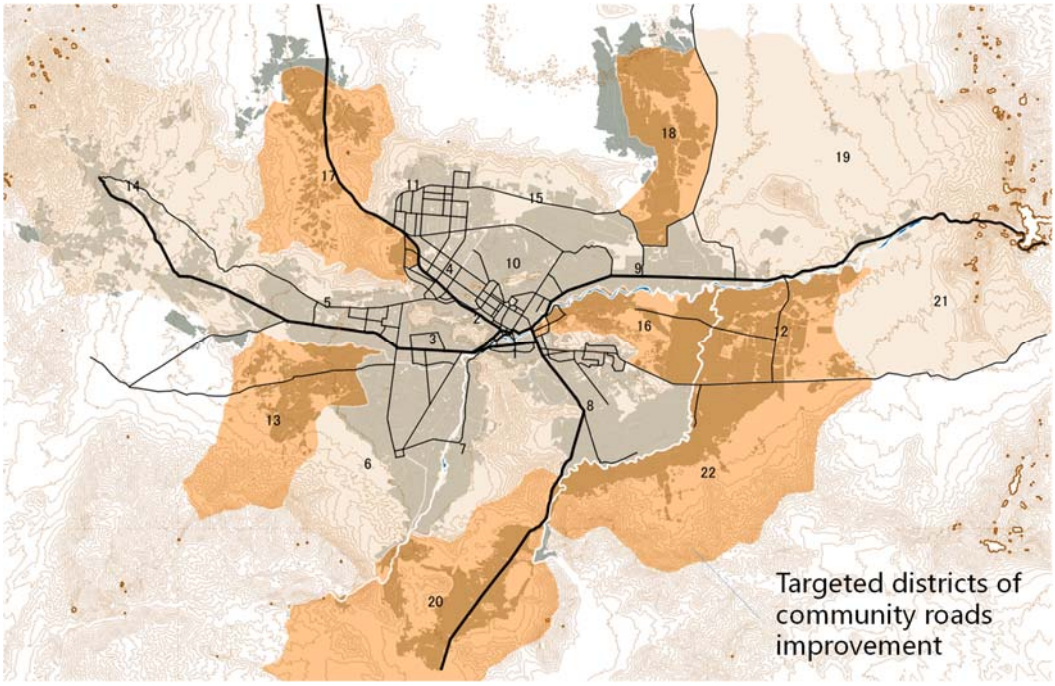
3.7 On-going/planned urban transportation projects in Kabul Metropolitan Area

The table below shows projects underway or being planned in the Kabul Metropolitan Area.

Table 3.7.1 On-going or planned transportation projects in Kabul

Type of work	Implementing entities		Project name, contents
Implement project; provide materials, equipment	KM	Public Transport Directorate	・Pedestrian bridge construction（10 bridges (in 2020); 25 bridges (planned for 2021) ・Interlocking pedestrian facilities (38,000 km^2 : public notices) bicycle path construction (planned for 2021) ・Bus stop construction (264 locations), nearly completed
		Infrastructure Directorate	・Construction of community roads (Districts 12,13,16 - 18,20,22; total length 30 km planned) ・Flyover construction (Sarai Shamali; planned)
		Traffic Affair Coordination Directorate	・Improvement of intersections, from roundabouts to intersections with signals (Part to be done as KUTEI) (See W/B below)
	MOT (for Indian government)		・Provision of spare parts for buses (enough for 350 buses; 50% delivered); Provision of buses (being planned)
	CRIDA		・Road construction in Kabul and outer areas under its jurisdiction (in progress, or planned)
Technical cooperation	Japan International Cooperation Agency (JICA)		・Technical Cooperation Project for Road Management (completed in 2021) ・Land, District Reallocation Project, Technical Cooperation Project for City Redevelopment (Planned)
	World Bank (W/B)		・KUTEI (Kabul Urban Transport Efficiency Improvement Project) and Phase-2

Source: JICA Study team based on hearings with Kabul Municipality and Milli Bus Enterprise



Source: JICA Study Team

Figure 3.7.1 Districts targeted for community road improvement project

During the KUTEI project carried out by the World Bank, around the autumn of 2018, attention turned to the traffic aspect of the project, and additional proposals were considered. Subsequently, however, these were shelved, and discussions continued. Measures initially considered and additional items are indicated below:

1. Data Collection and Analysis of Existing Situation
2. Transport appraisal, network wide traffic management plan and designs of short term solutions
3. Conceptual design for area wide traffic management plan, car parking facilities (for Kabul City Center Area)
4. Conceptual Design for Bus Priority Measures (for Entire Kabul City)
5. Conceptual Design for Redevelopment
6. Public participation/communications plan
7. Developing Environmental & Social Impact Assessment (ESIA) Report
8. Pedestrian and Bicycle Path Network Plan (City Center Area)
9. Street Vendors Management

3.8 Ministries/Agencies in charge of policy making and implementation in urban transportation sector for Kabul Metropolitan Area

3.8.1 Summary of related organizations

The related organizations are in Kabul City, and they have a Vice Mayor in charge of transportation. Three departments work under the Vice Mayor in this sector: the Infrastructure Planning Department, the Public Transportation Department, and the Transportation Management Department. The staff for these departments, including transportation control officers and bus drivers, has grown to about 250 persons.

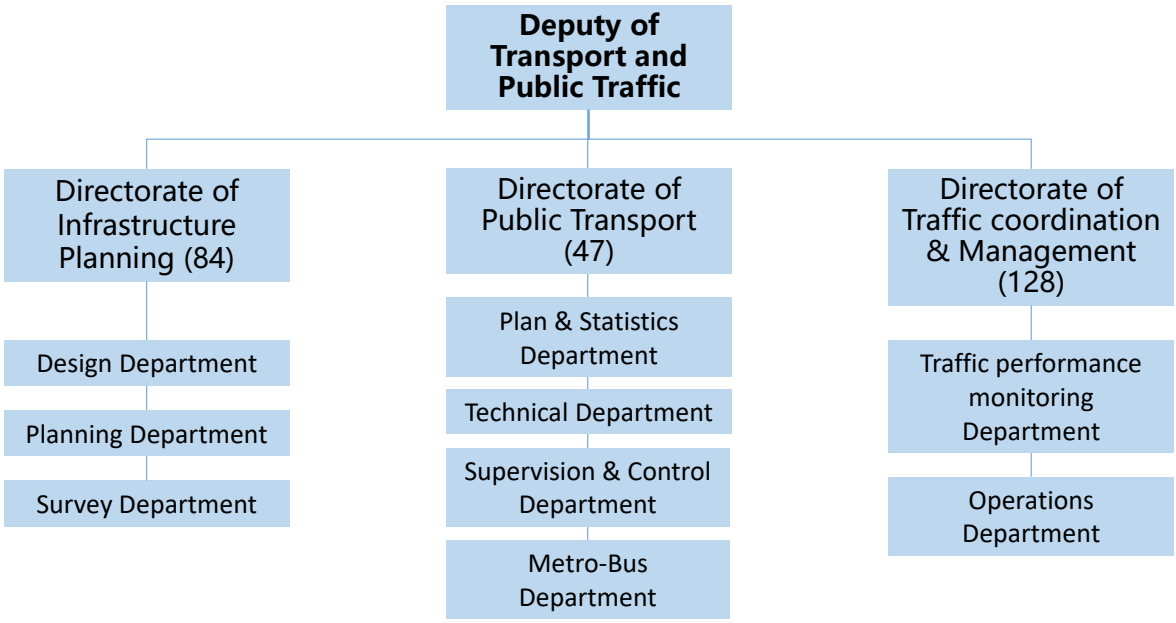
In addition, the Afghanistan Transport Ministry and the Capital Region Independent Development Authority (CRIDA) in Kabul can be viewed as among the related organizations. Public buses come under the jurisdiction of the Transport Ministry, while private bus company operations are overseen by Kabul City.

While Kabul City was basically in charge of road infrastructure construction in areas under its jurisdiction, in some cases CRIDA took over management of a portion of this work.

Under an agreement on allocation of roles made in 2017, KM and the Afghanistan Ministry of Interior (MOI) worked out the administration of the Transportation Police.

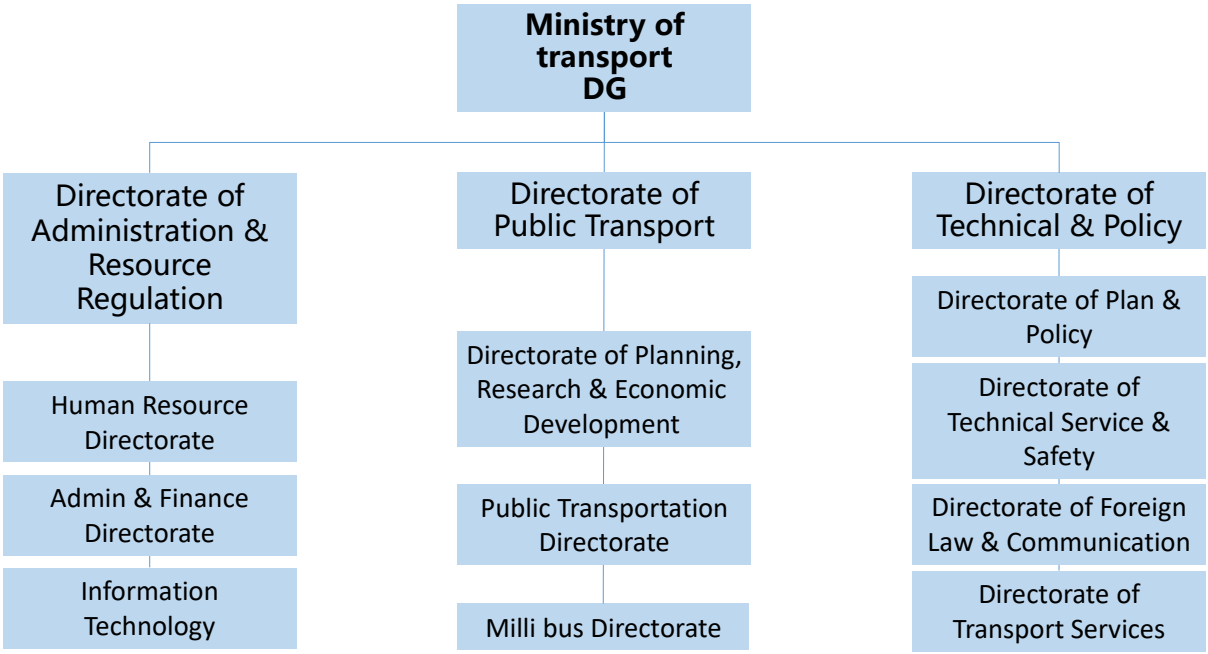
3.8.2 Organization charts

The charts shown below show the interrelationships of the organizations involved.



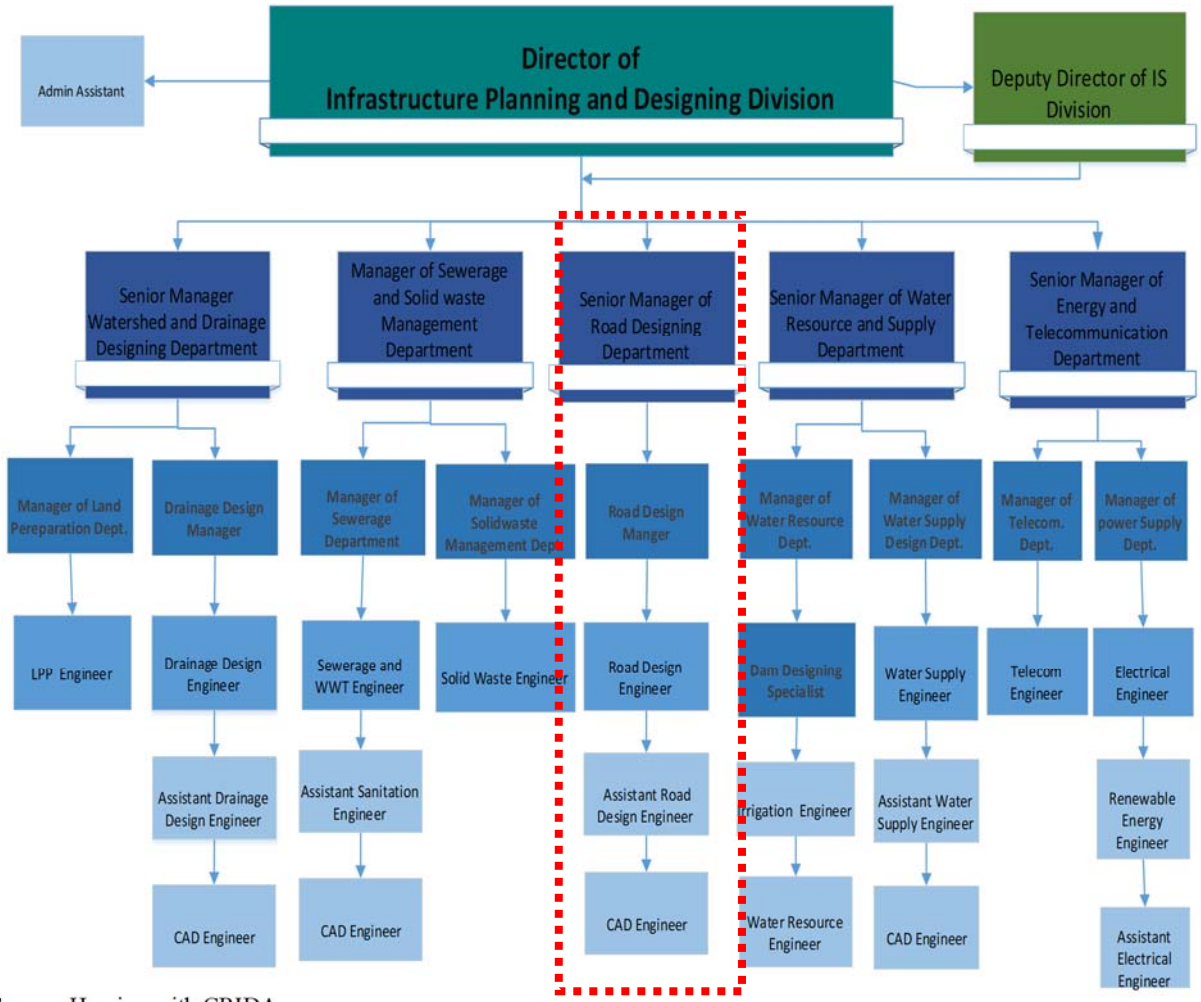
Source: JICA Study Team based on hearing with Kabul Municipality

Figure 3.8.1 Organizational system for the administration of urban transportation in Kabul



Source: JICA Study team based on hearing with Ministry of Transport

Figure 3.8.2 Organizational system for the administration of urban transportation under the Afghanistan Ministry of Transport



Source: Hearing with CRIDA

Figure 3.8.3 Organizational system for the administration of urban transportation under CRIDA

3.8.3 Participation of educational institutions

A 2021 presidential notification set forth a system for the participation of universities and other educational institutions in international cooperation projects related to the country's policy decisions and the Master Plan for National Development. Among the points covered in the notification were how the following two universities, which have related academic departments, would participate in the field of urban transportation (in Kabul City).

(1) Kabul Polytechnic University

This university has a School of Transportation Engineering with a Highway and Transportation Department and a Railway Department.

(2) Kabul University

This university has a School of Engineering with a Civil Engineering Department and a Transportation Section.

3.9 Cooperation in urban transportation sector from other donors

Among the main donors providing assistance to Afghanistan along with the World Bank (W/B) and the Asian Development Bank (ADB) are the EU and the United States (USAID). The W/B is Afghanistan's biggest donor in the transportation field. Others providing assistance include the Afghanistan Reconstruction Trust Fund (ARTF), the International Finance Corporation (IFC), and the International Development Association (IDA). The ADB also provides aid through the Asian Development Fund (ADF). Other forms of T/A and loans are also received. The ADB also provides assistance in drafting of the Transportation Master Plan. EU assistance is centered on cooperation in the social sector, particularly in the railway field. USAID provides significant cooperation in renovation of the transportation sector, primarily in highway construction.

Chapter 4 Field traffic survey and summary of traffic demand analysis

4.1 Review of transportation studies and field traffic surveys in past

The results of major studies on the transportation situation in the Kabul Metropolitan Area are included in the JICA M/P (2009), UN-HABITAT (2016), and the BRT M/P (2018). An outline of each survey is provided in Table 4.1.1

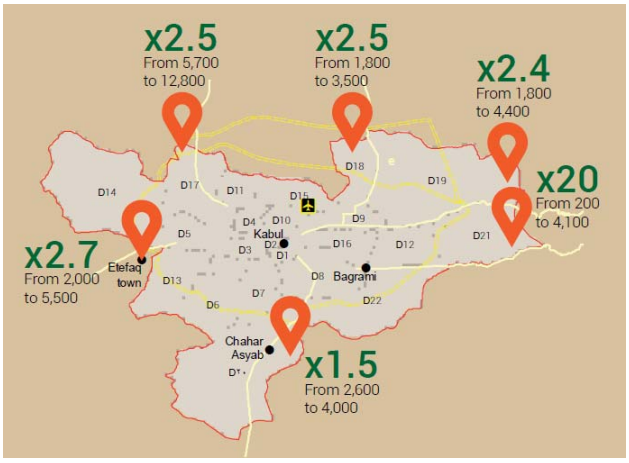
Table 4.1.1 Summary of field traffic surveys in transportation studies

Survey name	Transportation situation	Demand projections	Notes
JICA M/P	・PT survey (5,000 households) ・Cordon line traffic volume survey (6 points) ・Screen line traffic volume survey (3 points)	・Target year: 2025 ・OD table for each purpose, each method ・Volume of road traffic	Transportation situation as of August 2008
BRT M/P	・Road traffic volume (26 points) ・Intersection traffic volume (25 points) ・Roadside OD survey (32 points) ・Bus terminal survey (10 points) ・Traveling speed survey (6 points)	・Target year: 2030 ・Volume of road traffic (AM peak) ・BRT transportation volume (PPHD)	Transportation situation as of December 2017
UN-HABITAT	・Cordon line traffic volume survey (6 points)	—	As of February 2016

Source: JICA Study Team

This study was based on a survey with updated demand forecasts of the transportation situation conducted for the JICA M/P. As part of this effort, in 2008, a PT survey visits covering 5,000 households was conducted, and an estimate population flow was made. To accurately grasp movements of people, a percentage of the urban population was established as a sample, as it was basically necessary to study the movements of an adequate number of people in the urban region to meet this standard. However, it was difficult to survey the actual situation on that type of scale. It was therefore decided to conduct a Cordon line survey that would reflect the striking population increase in the Kabul City region as the movement of people between the outer areas of the region and the central area was grasped. A screen line survey was conducted in combination with this to learn about the origins and destinations of automobile trips crossing the survey point. In this way, changes in the flow situation were determined.

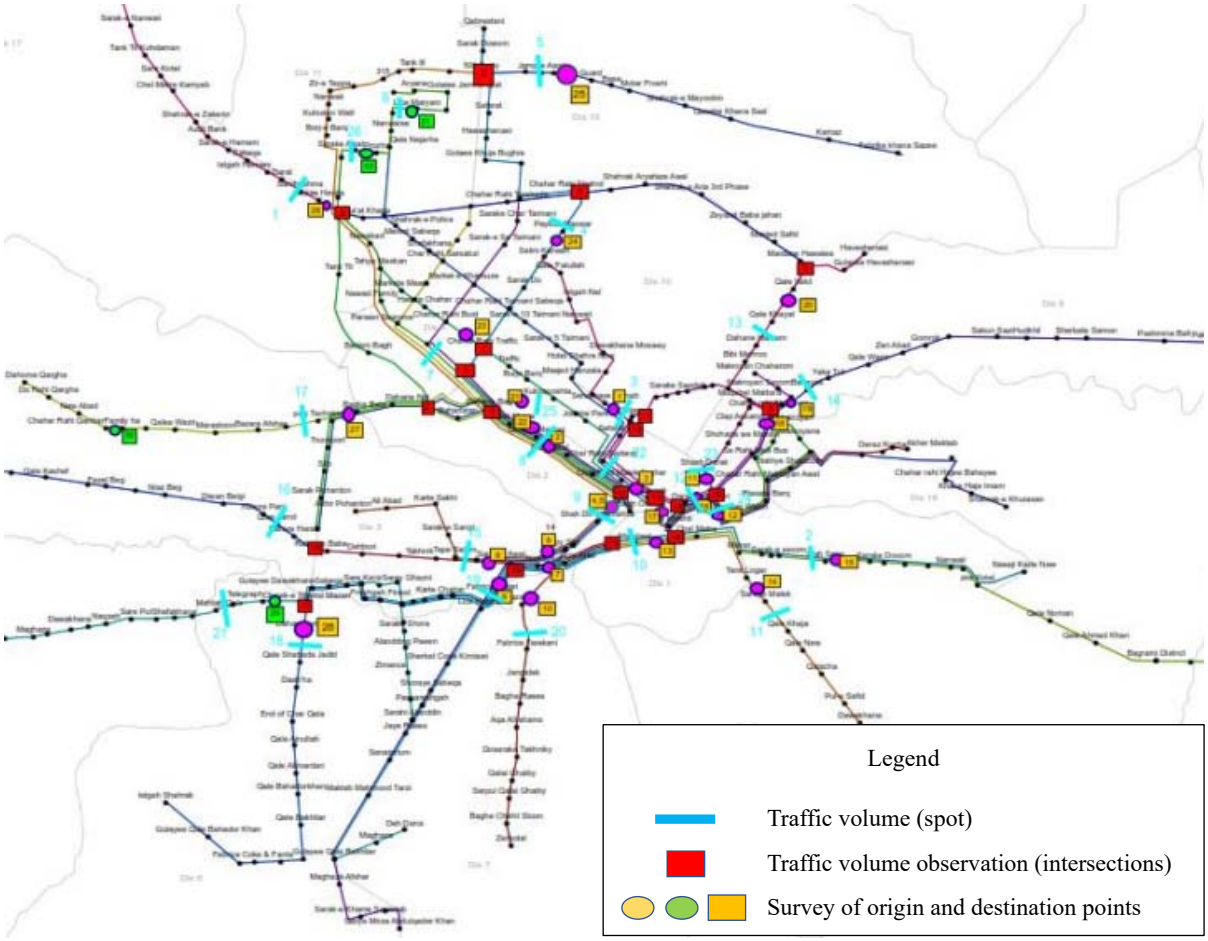
The outline of the surveys presented in Table 4.1.1 indicates how the UN-HABITAT survey was conducted using the same points as those used in the 2008 Cordon line survey in the JICA M/P; this enables a comparison of traffic flows in 2008 and 2016. The results of this comparison show how the inward flow from the outer areas roughly doubled in the eight-year period, which confirms the expansion occurring the Kabul City region.



Source: Discussion Paper #6, Series Two, March 2016, UN-HABITAT

Figure 4.1.1 Changes in the volume of traffic into the Kabul City region (comparison of 2009 and 2016)

A large-scale survey of traffic volumes was conducted for the BRT M/P study. This survey was, after all, conducted to update information on the flows of people estimated in the JICA 2008 M/P. The basic idea of using household visits for a PT survey was not adopted; instead, many observation points on the roads were used to survey the traffic, and to examine origin and destination points in automobile traffic in order to be able to estimate the flow situation. The zoning, which was established in the JICA M/P, was used to organize the data showing the flow situation.



Source: BRT M/P

Figure 4.1.2 View of survey points in study of transportation situation presented in BRT M/P

4.2 Outline of additional field traffic survey and results

4.2.1 Types of traffic surveys

As indicated above, the surveys of the transportation situation outlined in Table 4.2.1 were planned to update the data needed to analyze transportation demand. The contents (types, locations, and scale of the surveys) were planned in advance by the study teams and conducted based on an agreement with counterparts. The screen line and cordon line surveys were conducted as joint surveys with Kabul City. Concerning the flow situation studied using location information obtained with portable terminals, information specific to individuals from the GPS provider was removed, and then the information was purchased as GPS data for use in organizing information on the flow situation. In addition, the content of a questionnaire survey (Stated Preference- SP survey) to be conducted to confirm intentions to utilize new means of transportation was designed.

Table 4.2.1 Contents of traffic survey

Survey items	Purpose of survey	Outline of survey
Screen line traffic volume survey; Cordon line traffic volume survey	To update OD table showing persons and conditions in 2008 created for JICA M/P; to create an OD table for 2020 based on persons and current situation.	After making a video recording for each direction, traffic volumes were tabulated by analyzing video images; volumes for vehicle types and for each time frame were determined.
Person trip flows	To supplement person-based OD table created for JICA M/P in 2008; created to grasp most recent flow patterns in districts with sharp increase of population.	Individual cell phone location information was tabulated as big data; data on movements (flow) of people was organized.
SP interview survey	Conducted to estimate conversion of transportation to BRT whose introduction was being planned.	A questionnaire survey via cell phones or the Web was conducted; survey results were tabulated and analyzed to create a model for each means of transportation's share in moving people.

Source: JICA Study Team

4.2.2 Cordon line survey and screen line survey

(1) Survey locations

The Cordon line survey was conducted at six locations (C1 – C6), and the screen line survey was conducted at three locations (S1 – S3). As seen in Figure 4.2.1, the survey were conducted at the same locations as those used in the JICA M/P in 2008. Cordon lines were to be set at Kabul City boundaries, but for security reasons the observations could not strictly be made at precise boundary locations. Therefore, for survey purposes, borders at locations such as police checkpoints were visualized as boundaries setting off the central part of Kabul City. Asmai Mountain, which separates east from west parts of Kabul, was set as a screen line.

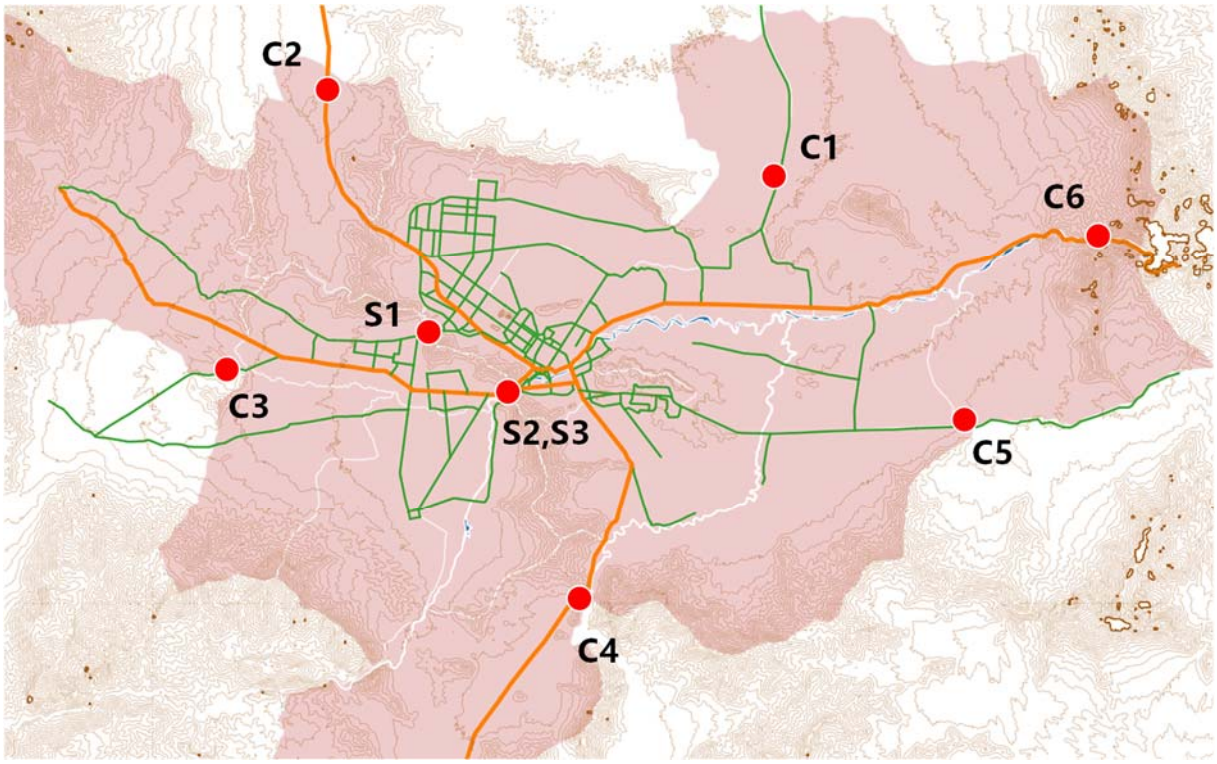


Figure 4.2.1 Locations of traffic survey

Table 4.2.2 Road names for traffic survey implementation

Location	Road name	Location	Road name
C1	PR-Bagram Road	C4	NH08 (Logar Road)
C2	RH04 (Mazar-e Sharif Road)	C5	PR-Bagrami Road
C3	RH01 (Kandahar Road)	C6	RH05 (Jalalabad Road)

Location	Road name
S1	Baghbala Road
S2	Jadayi Sehi Aqrab Road
S3	Gozarga Road

Note: Regional Highway, NH: National Highway, PR: Provincial Road

(2) Survey methods

During the survey traffic data such as traffic volumes at each observation point were recorded; drivers were interviewed (to learn origin and destination points); and numbers of passengers in each vehicle were noted (visually or by measurements). Also, video cameras were set up at observation points to count vehicles moving in each direction, and the video images were used to tabulate traffic flow by type of vehicle. Twenty-four hour monitoring (6:00 a.m one day to 6:00 a.m. the following day) was done at two locations, C2 and S3, and 16-hour monitoring (0600 - 2200) was done at the remaining locations.

The sampling survey method was adopted for the driver interviews, which were conducted mainly to learn origin and destination points. Regardless of the vehicle type, vehicles passing through the survey locations were stopped randomly and the drivers were asked about their starting point and destination and number of passengers. In cases in which counting passengers was difficult, that is for buses or large-scale vehicles, the count was registered according to how full the vehicle was (level of crowdedness).

Vehicles were classified into eight categories: two-wheel vehicles, microbuses, minibuses, large-scale buses, taxis, private automobiles/4WD, trucks, and others.

Table 4.2.3 Crowded levels used to indicate passenger counts in buses

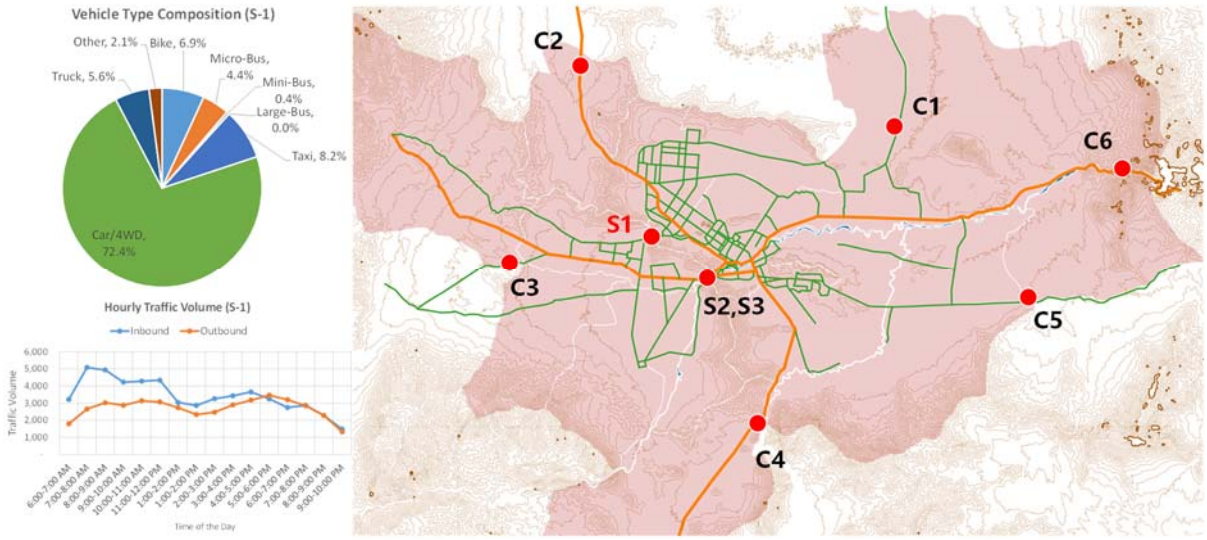
Crowded level	1	2	3	4	5
Percentage of vehicle occupied	< 30%	30-60%	60-90%	90-120%	120% <

(3) Survey results

By examining the traffic leaving and entering Kabul City based on the cordon line survey results, it was found that traffic flow was greatest at C2 location - approximately 17,000 vehicles per day in each direction. It was also learned that a large flow of traffic passes through the northern cross section in the direction of Charikar Village. Also, approximately 9,000 vehicles per day passed through C5 in both directions. About 5,000 to 7,000 vehicles per day passed through the other four observation points.

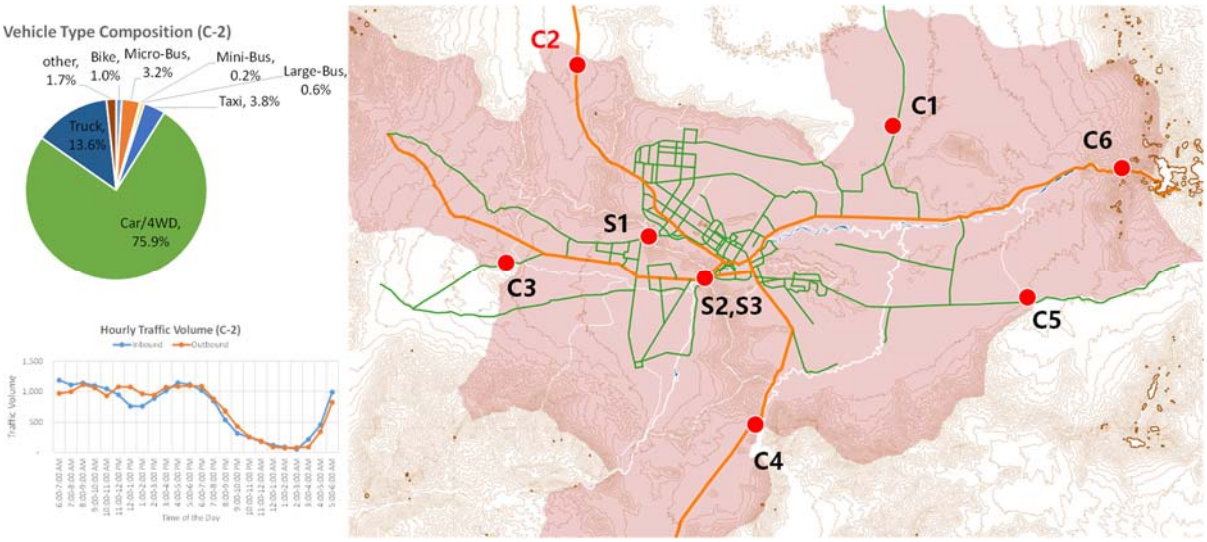
Private autos accounted for about one-half the traffic flow. Trucks also accounted for a high percentage, while the percentage of buses (of all types) was low - no more than six percent.

The screen line survey results show a heavy flow of traffic through the cross section at Asmai Mountain. The survey indicated that, in each direction, as many as 50,000 vehicles per day crossed two of the three lines used.



Source: JICA Study Team

Figure 4.2.2 Results of screen line survey of traffic flow at 24-hour observation point (S1)



Source: Prepared by Study Team

Figure 4.2.3 Results of cordon line survey of traffic flow at 24-hour observation point (C2)

Table 4.2.4 Results of cordon line survey of traffic flow

Observation point	Direction	Hours surveyed	2-wheel	Microbus	Minibus	Large bus	Taxi	Auto/4WD	Truck	Others	16-hour total	24-hour total
C1	Entering	16	179	161	8	3	306	2,601	1,939	293	5,490	6,368
	Leaving	16	164	148	7	-	296	2,583	1,768	298	5,264	5,948
C2	Entering	24	190	538	39	98	688	13,021	2,366	309	14,870	17,249
	Leaving	24	154	576	44	104	640	13,240	2,326	286	15,372	17,370
C3	Entering	16	426	814	9	76	376	2,525	1,073	371	5,670	6,577
	Leaving	16	525	1,060	12	94	419	3,079	1,675	441	7,005	7,916
C4	Entering	16	57	38	225	22	900	3,761	538	275	5,816	6,747
	Leaving	16	60	39	209	16	914	4,115	603	259	6,215	7,023
C5	Entering	16	309	169	1	-	119	2,347	953	4,521	8,419	9,766
	Leaving	16	268	128	2	-	135	2,109	926	4,379	7,947	8,980
C6	Entering	16	38	649	29	3	126	3,267	386	125	4,623	5,363
	Leaving	16	68	640	10	3	111	3,126	445	118	4,521	5,109
Total	Entering		1,199	2,369	311	202	2,515	27,522	7,255	5,894	47,267	52,070
	Leaving		1,239	2,591	284	217	2,515	28,252	7,443	5,781	48,322	52,346
	Entering/ Leaving		2,438	4,960	595	419	5,030	53,774	14,698	11,675	95,589	104,416
	Percentage		2.6%	5.2%	0.6%	0.4%	5.3%	58.3%	15.4%	12.2%	100%	

Source: JICA Study Team

Table 4.2.5 Results of screen line survey of traffic flow

Observation point	Direction	Hours surveyed	2-wheel	Microbus	Minibus	Large bus	Taxi	Auto/4WD	Truck	Others	16-hour total	24-hour total
S1	Entering	16	3,574	2,276	188	17	4,420	40,716	2,904	875	54,970	57,719
	Leaving	16	3,166	2,039	236	22	3,636	30,439	2,576	1,187	43,301	45,466
S2	Entering	16	8,175	4,735	639	23	3,622	24,914	2,025	969	45,102	47,357
	Leaving	16	9,819	4,775	620	33	3,985	27,755	2,233	962	50,182	52,691
S3	Entering	24	11,361	3,437	100	-	967	7,581	580	460	2,320	24,486
	Leaving	24	7,252	3,056	70	1	1,256	9,363	627	655	21,219	22,280
Total	Entering		23,110	10,448	927	40	9,009	73,211	5,509	2,304	124,558	129,562
	Leaving		20,237	9,870	926	56	8,877	67,557	5,436	2,804	115,763	120,437
	Entering/ Leaving		43,347	20,318	1,853	96	17,886	140,768	10,945	5,108	240,321	249,999
	Percentage		18.0%	8.5%	0.8%	0.0%	7.4%	58.6%	4.6%	2.1%	100.0%	

Source: JICA Study Team

4.2.3 Numbers of public transportation users

The average number of passengers by direction of travel and vehicle type are indicated below.

Table 4.2.6 Average numbers of passengers by vehicle type (cordon line)

Observation point	Microbus	Minibus	Large bus	Taxi	Auto
C1	8.0	8.3	23.2	4.1	3.8
C2	7.3	10.2	26.8	4.5	4.1
C3	6.0	10.5	30.2	3.4	3.4
C4	7.3	10.2	26.8	4.5	4.1
C5	2.9	4.7	23.4	3.5	2.7
C6	8.3	10.6	9.8	4.1	4.2

Source: JICA Study Team

Table 4.2.7 Average numbers of passengers by vehicle type (screen line)

Observation point	Microbus	Minibus	Large bus	Taxi	Auto
S1	7.3	12.1	23.1	2.6	2.9
S2	7.5	12.1	29.0	2.6	2.8
S3	7.7	12.5	20.6	2.6	2.7

Source: JICA Study Team

The surveys make it possible to grasp average numbers of people (including passengers) and numbers of vehicles of each type passing each observation point. Tabulation of the numbers of people crossing the cordon line, in other words the numbers of people coming and going between the central part of Kabul City and the suburban districts, showed a flow of 350,000 people per day. Seventy-five percent of the travelers were using private automobiles, and the remaining 25% were using public transportation.

The screen line survey of movement of people in the city indicated a flow of about 710,000 people moving in an east-west direction in Kabul City, 64% in private autos and the remaining 36% using public transportation.

Table 4.2.8 Number of persons crossing cordon line

Observation point	Direction	Hours surveyed	2-wheel	Microbus	Minibus	Large bus	Taxi	Auto/4WD	Truck	Others	16-hour total	24-hour total
C1	Entering	16	179	1,336	64	70	1,255	9,884	1,939	293	15,019	17,422
	Leaving	16	164	1,228	56	-	1,214	9,815	1,768	298	14,543	16,434
C2	Entering	24	190	3,927	398	2,626	3,096	53,386	2,366	309	57,154	66,299
	Leaving	24	154	4,205	449	2,787	2,880	54,284	2,326	286	58,078	67,371
C3	Entering	16	426	4,884	95	2,295	1,278	8,585	1,073	371	19,007	22,048
	Leaving	16	525	6,360	126	2,839	1,425	10,469	1,375	441	23,559	26,622
C4	Entering	16	57	277	2,295	590	4,050	15,420	538	275	23,502	27,262
	Leaving	16	60	285	2,132	429	4,113	16,872	603	259	24,752	27,970
C5	Entering	16	309	490	5	-	417	6,337	953	4,521	13,031	15,116
	Leaving	16	268	371	9	-	473	5,694	926	4,379	12,120	13,696
C6	Entering	16	38	5,387	307	29	517	13,721	386	125	20,511	23,792
	Leaving	16	68	5,312	106	29	455	13,129	445	118	19,663	22,219
Total	Entering		1,199	16,302	3,163	5,610	10,612	107,333	7,255	5,894	157,369	171,940
	Leaving		1,239	17,761	2,878	6,084	10,559	110,263	7,443	5,781	162,008	174,311
	Entering/ Leaving		2,438	34,063	6,041	11,694	21,171	217,596	14,698	11,675	319,377	346,251
	Percentage		0.8%	10.7%	1.9%	3.7%	6.6%	68.1%	4.6%	3.7%	100.0%	

Source: JICA Study Team

Table 4.2.9 Number of persons crossing screen line

Observation point	Direction	Hours surveyed	2-wheel	Microbus	Minibus	Large bus	Taxi	Auto/4WD	Truck	Others	16-hour total	24-hour total
S1	Entering	16	3,574	16,615	2,275	393	11,492	118,076	2,904	875	156,204	164,014
	Leaving	16	3,166	14,885	2,856	508	9,454	88,273	2,576	1,187	122,904	129,049
S2	Entering	16	8,175	35,513	7,732	667	9,417	69,759	2,025	969	134,257	140,970
	Leaving	16	9,819	35,813	7,502	957	10,361	77,714	2,233	962	145,361	152,629
S3	Entering	24	11,361	26,465	1,250	-	2,514	20,469	580	460	60,094	63,099
	Leaving	24	7,252	23,531	875	21	3,266	25,280	627	655	58,578	61,507
Total	Entering		23,110	78,592	11,257	1,060	23,423	208,304	5,509	2,304	353,559	368,082
	Leaving		20,237	74,228	11,233	1,486	23,080	191,267	5,436	2,804	329,771	343,184
	Entering/ Leaving		43,347	152,821	22,489	2,546	46,504	399,572	10,945	5,108	683,331	711,267
	Percentage		6.3%	22.4%	3.3%	0.4%	6.8%	58.5%	1.6%	0.7%	100.0%	

Source: JICA Study Team

4.2.4 Roadside OD interview survey

In the cordon line and the screen line surveys, along with recording the flow of traffic passing each observation point, driver interviews were conducted to understand the origins and destinations of each trip. The interview surveys were done for 16 hours, from 0600 to 2200, at all of the observation points. The drivers were randomly selected among those who agreed to stop their vehicles on the shoulder of the road. The following results were obtained from sampling done at each point.

The sampling rate exceeded 20% at each point; at the highest point it was 43%. The sufficient accuracy of the results was indicated by the average rate of the sample being 29%, which is high.

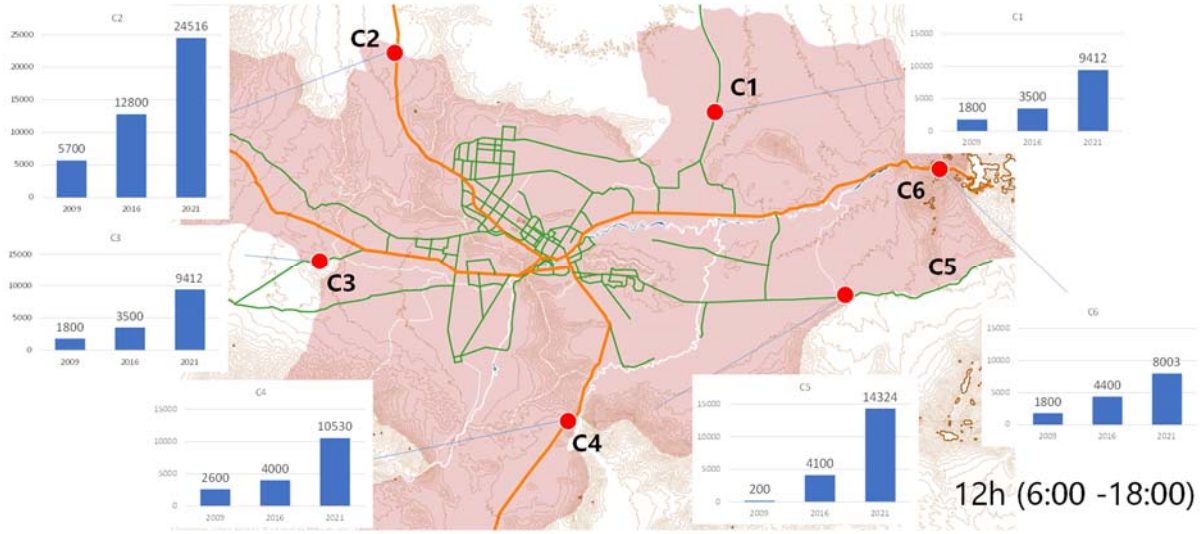
Table 4.2.10 Interview survey results (sampling rate)

Survey location		Number of interviews	All vehicles	Sampling rate
Cordon	C1	3,984	9,820	41%
	C2	9,960	33,680	30%
	C3	2,138	10,912	20%
	C4	3,558	11,380	31%
	C5	1,692	6,889	25%
	C6	3,184	8,795	26%
Cordon total		24,516	81,476	30%
Screen	S1	25,930	89,469	29%
	S2	17,944	75,359	24%
	S3	11,729	27,038	43%
Screen total		55,603	191,866	29%
All locations total		80,119	273,342	29%

Source: JICA Study Team

4.2.5 Analysis of fluctuation of traffic volumes

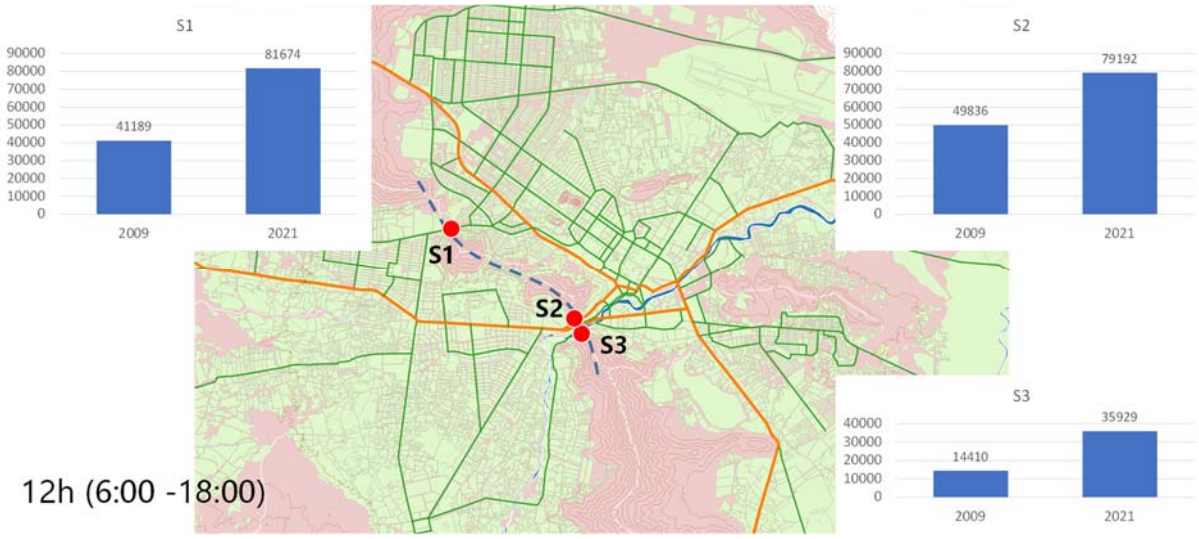
Changes in traffic volumes at cordon line and screen line observation points are compared from 2008 up until now. First, traffic flow changes at the cordon line locations were compared for three time-points, the years 2009, 2016 and 2021. The traffic volume has greatly increased at all points. On average, the traffic volume increased by a factor of five, and the annual trend was a steady increase in the flow from the Kabul suburbs into the central part of the city.



Source: JICA Study Team

Figure 4.2.4 Changes in traffic volumes observed in cordon line survey

In the same way, data from screen line survey points shows great increases. The traffic flows approximately doubled over the recent ten-year period.



Source: JICA Study Team

Figure 4.2.5 Changes in traffic volumes observed in screen line survey

4.3 Analysis of person trips flow using mobile phone big data

Traffic flows were analyzed using GPS data from cell phone users in Afghanistan, which was purchased from a Singapore GPS data provider company. This arrangement made it possible to access a sample of 130,000 monthly active users (MAU), as well as 110,000 daily active users. This data included images from users for one month, September 2020 (Monday through Thursday). This data was tabulated and analyzed.

Figure 4.3.1 provides an example of late-night image data showing users' locations. Basically, the images are from residential districts. Although the samples are fairly evenly distributed in Kabul's central area, fewer are from the southern and eastern sides of the area. The image shows the positions of users active very late at night. During those hours, the level of activity was low. The activity will be very different during the daytime, which will be shown next.

Source: JICA Study Team

Figure 4.3.1 Active location data in night (01:00–04:00)

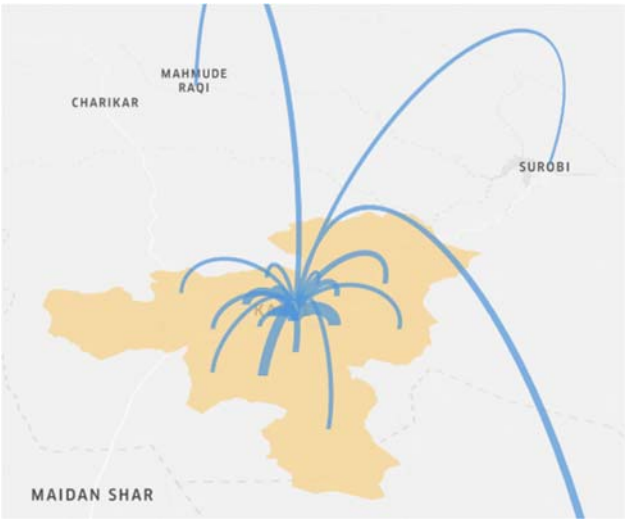
Figure 4.3.2 shows daytime samples (using a heat map) of activity in the central area of Kabul City. The

image shows several areas with scattered activities, including the City Hall area located in the center of the city.

Source: JICA Study Team

Figure 4.3.2 Active location data in daytime（9:00–12:00）

Figure 4.3.3 shows general weekday flows of people in Kabul. Along with the general situation in the city's central area and 22 districts, the flows into the city from the bordering satellite cities also appear to some extent. The results of an analysis of this information were used to confirm the repeatability for revising flow data (current OD table) in the effort to forecast the demand which will be discussed later.



Source: JICA Study Team

Figure 4.3.3 General weekday flow situation in Kabul

4.4 Survey of preference for BRT in Kabul

4.4.1 Summary of the SP survey

There is no BRT system in Kabul metropolitan Area. This makes difficult to ascertain the degree to which citizens intend to use one. Interviews and questionnaire surveys are often used when a new system is to be introduced. Stated Preference (SP) surveys are commonly used in cases like this — to grasp what prospective users' preferences are.

4.4.2 Design of the SP survey

The BRT is to be part of the public transportation system. It was basically thought that prospective BRT users currently using some kind of transportation would shift — most likely, it was presumed, from (current) bus users or to lesser extent from automobile users.

In designing the SP survey questionnaire, a map showing the lines proposed and the expected effect of the introduction was included to help respondents understand concretely what would be introduced. Along with a concrete explanation of the situation after the new system is introduced, a direct comparison of what was currently available with the new level of service expected after the new system was depicted. In that way, the respondents were made aware of the benefits they could expect from the new system.

The questionnaire form is as shown in Figure 4.4.2.

Table 4.4.1 Questionnaire survey items

Item	
Individual data	Age, gender, license and vehicle ownership, occupation, income
Usual travel	Purpose, origin and destination points, time taken, cost, frequency
Intention to use new system	Confirm intention to use new system
Expectations of new system	What effects are expected of new system (less traffic congestion, shorter travel time)

Source: JICA Study Team

Type2 For Bus users

Interview survey of stated preference survey for Bus Rapid Transit in Kabul

Type2 For Bus users

○○, 2021 Yachiyo Engineering CO Ltd.

<Instruction for Interviewers>

・There are hour four (4) questionnaire forms. Please answer all questions one by one in sequential order.
Print the information in the space provided or put a check mark in the appropriate box.
If you have doubts in answering any point in the questionnaire, please consult the interviewer.

Question1 Information for each respondent

In question1, each questionnaire is shown by several alternatives. Every interviewer should ask each questionnaire one by one and fill the one of the alternative.

Question2: Information of a trip on today

In question2, information of the trip which each respondent make on the survey day should be completed.

Question3: Stated Preference on use of the Bus Rapid Transit

In question3, nine (9) binary comparisons (between conventional transport and Bus Rapid Transit) are indicated with level of service on each mode. Every interviewer should ask nine comparisons one by one to respondents, and fill all of alternatives.

Question4 Interests and expectation for the Bus Rapid Transit

In question4-1, each questionnaire is shown by five (5) steps to understand the level of interests and expectation of direct effect for implementation of BRT because some problems related to transportation systems, city planning and environment will be solved for implementation of Bus Rapid Transit.
Every interviewer should ask each questionnaire one by one and fill the one level (1 to 5).

In question4-2 expectation of indirect effect on BRT are indicated. Every interviewer should ask to respondents to select all of alternatives which the each respondent expects.

1

Source: JIAC Study Team

Figure 4.4.1 SP questionnaire explanation sheet (for bus users)

Type2 For Bus users

Question1 Information for each respondent

Q1: Please fill the information of your personal attribute.

Age	1. －10　2. 11－20　3. 21－30　4. 31－40　5. 41－50　6. 51－60　7. Above 60
Gender	1. Male　2. Female
Driving license	1. Yes　2.No
Number of you own	Motorcycle / Scooter (　　)　Car, Jeep. Van (　　)
Type of Jobs	1. Government　2. Semi Govt./ Public　3. Private Company 4. Retired　5. Unemployed　6. Housewife　7. No response
Income Level (per month)	1. 0-5,000 AFN/ month　2. 5,000 – 12,500 AFN/Month 3. 12,500-100,000 AFN/ month　4. Over 100,000 AFN/Month

Question2 Information of a trip on today

Q2: To indicate your trip on today, please fills the parenthesis or selects the alternative number.

Q2-1 Purpose of the trip				
1. To Work　2. To School for Study　3. On Business / Duty / Work　4. Leisure / Recreation 5. Other purpose (　　)				
Q2-2 Trip procedure of your trip				
Origin	Address (Where trip start)	City/Region name	(　　)	
		Town name	(　　)	
Destination	Address (Where trip end)	City/Region name	(　　)	
		Town name	(　　)	
Access method to the bus stop	Mode (Multiple answer)	1.Walking　2.Bicycle　3.Motorcycle　4.Car (Private Transport) 5.Others (　　)		
	Access Time	(　)minutes		
Trip by Bus	Bus Stop Name	Bus Stop for Enter (　　)	Bus Stop for Exit (　　)	
	Travel Time	(　)hours		
	Fare	(　) AFN.		
	Trip Frequency	(　)times/week		

2

Source: JICA Study Team

Figure 4.4.2 SP questionnaire form (1) (for bus users)

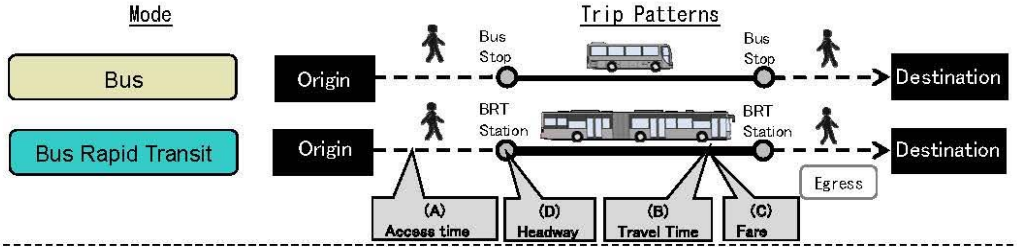
Type2 For Bus users

Question3: Stated Preference on use of the Bus Rapid Transit

In this question, hypothetical situation of implementation of Bus Rapid Transit is assumed.

Hypothetical situation

- Bus Rapid Transit is supported to be implemented.
- Available modes are Bus and Bus Rapid Transit (shown in the following Figure).



Q3: Please answer nine binary comparisons shown in the following (①~⑨) with considering level of services of each mode

Question No.	Mode	(A) Access time	(B) Travel Time	(C) Fare	(D) Headway	Select either one alternative
①	Bus	10 min	70 min	10 AFN	10 min	1. Choice Bus
	BRT	10 min	20 min	10 AFN	1 min	2. Choice BRT
②	Bus	20 min	70 min	10 AFN	20 min	1. Choice Bus
	BRT	20 min	20 min	12 AFN	5 min	2. Choice BRT
③	Bus	30 min	85 min	10 AFN	30 min	1. Choice Bus
	BRT	30 min	30 min	14 AFN	10 min	2. Choice BRT
④	Bus	20 min	85 min	10 AFN	30 min	1. Choice Bus
	BRT	20 min	30 min	10 AFN	10 min	2. Choice BRT
⑤	Bus	30 min	85 min	10 AFN	10 min	1. Choice Bus
	BRT	30 min	30 min	12 AFN	1 min	2. Choice BRT
⑥	Bus	10 min	100 min	10 AFN	20 min	1. Choice Bus
	BRT	10 min	40 min	14 AFN	5 min	2. Choice BRT
⑦	Bus	30 min	100 min	10 AFN	20 min	1. Choice Bus
	BRT	30 min	40 min	10 AFN	5 min	2. Choice BRT
⑧	Bus	10 min	100 min	10 AFN	30 min	1. Choice Bus
	BRT	10 min	40 min	12 AFN	10 min	2. Choice BRT
⑨	Bus	20 min	100 min	10 AFN	10 min	1. Choice Bus
	BRT	20 min	40 min	14 AFN	1 min	2. Choice BRT

3

Source: JICA Study Team

Figure 4.4.3 SP questionnaire form (2) (for bus users)

Type2 For Bus users

Question4 Interests and expectation for the Bus Rapid Transit

Q4-1: Please select your expectation level (Level is classified from 1 to 5) of effectiveness of the Bus Rapid Transit.

Index	Very Important ←		Neither	→	Not Important
Shorten your travel time	5	4	3	2	1
Improvement on traffic congestion	5	4	3	2	1
Improvement on travel cost	5	4	3	2	1
Improvement on traffic accidents	5	4	3	2	1
Improvement on environment (Reduction of emission gas)	5	4	3	2	1
Enhancement of safety and security	5	4	3	2	1

Q4-2: Please select your requirement and request for the Bus Rapid Transit. (Multiple Answer).

1. Promotion of urbanization	2. Promotion of industrialization
3. Improvement on environment (Reduction of emission gas)	
4. Saving fossil fuels	5.Ohters( )

4

Source: JICA Study Team

Figure 4.4.4 SP questionnaire form (3) (for bus users)

4.5 Transportation demand analysis

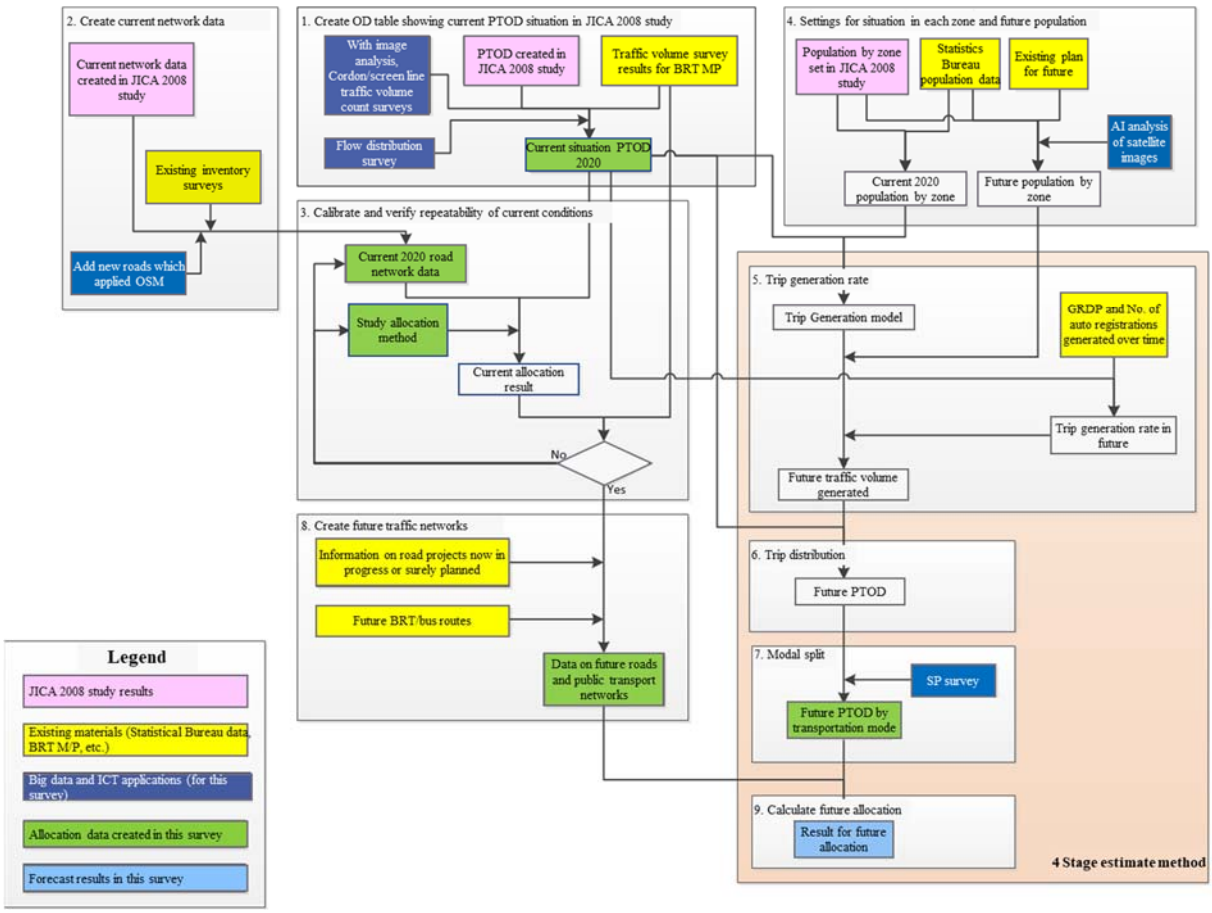
4.5.1 Available maps and GIS data

The Afghanistan National Kabul Regional Development Promotion Project has been under way since 2008. As part of the project, two types of topographical maps were created, one of the Kabul capital region drawn to a scale of 1/10,000 and another of the Kabul central area drawn to a scale of 1 to 5,000. In addition, a map of land use, rivers, transportation and other facilities was prepared using GIS data (CP, Afghanistan Geodesy and Cartography Head Office (AGCHO)). The results of this effort were received from the Afghanistan side, but later it was learned that the data had not been fully updated.

On the other hand, there was satellite image data created for the UN-HABITAT survey in 2018 including all areas of Kabul City, and orthographic image data; this data had been preserved by Kabul City and it was confirmed that it can be used in actual work.

4.5.2 Flow of traffic demand analysis

The framework for traffic demand forecast is shown in Figure 4.5.1. The population data and transportation data will be updated to the most recent, using as a base current status of the JICA M/P, OD tables, networks, and population in each zone as bases. The possibility of making practical use of big data, etc. will also be verified. The final output will forecast the transportation demand for specified road sections for the target years (short term: 2025; medium-term 2030; long-term 2040). These demand forecasts will be for public modes of transport (volume on a vehicle basis) and transportation volume (on a person basis).



Source: JICA Study Team

Figure 4.5.1 Flow of demand forecasts

4.5.3 Current demand forecast method and software for master plan

Traffic volume estimates were not made in the planning work for transportation in Kabul City. Donors depended on contracted consultants for this task. When the JICA M/P was drafted, JICA STRADA was used for analysis of transportation demand in all districts of the city and new cities. Using the results of the JICA M/P as a base, minor revisions are repeatedly being made for the analysis of transportation demand.

4.5.4 Revised current road network and OD table

Although the road network data in the 2008 JICA M/P is almost the same and not revised, revisions have already been made to the 2018 network data for the BRT M/P. Revisions are now being made to conform to this data.

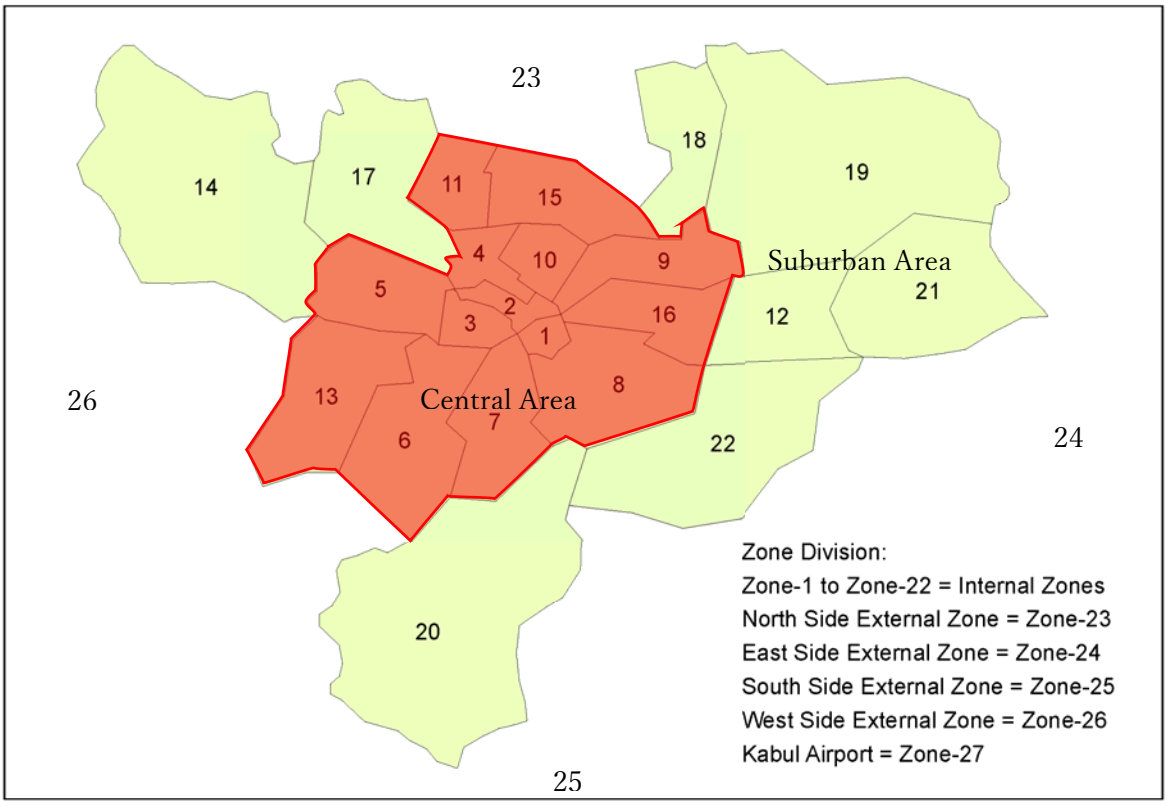
It is expected that the work to revise the current OD table will follow as outlined in section 4.5.2.

Source: BRT M/P

Figure 4.5.2 Map of current road network

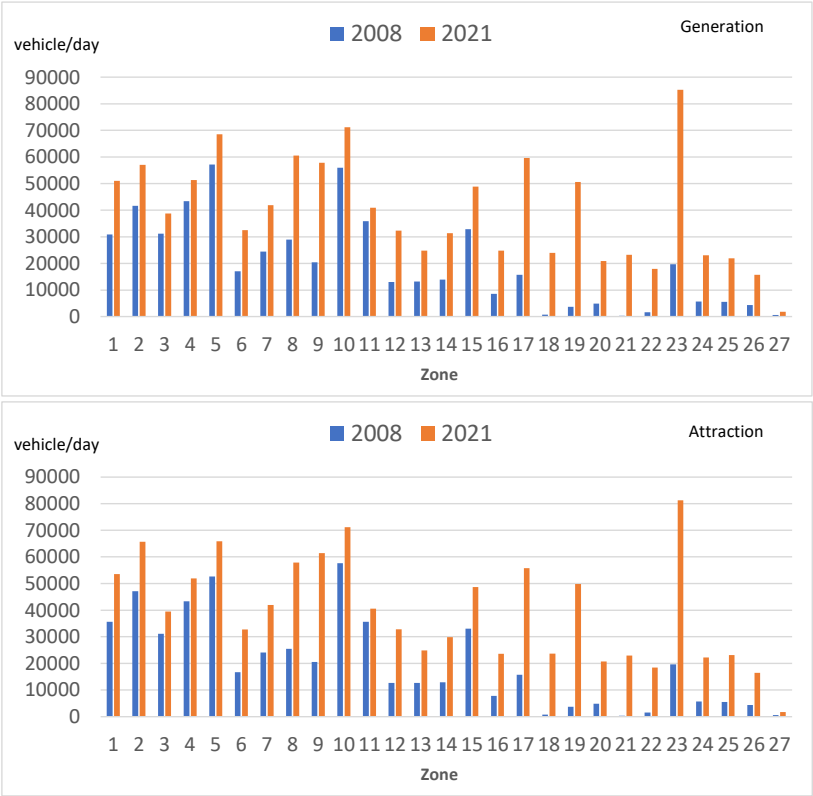
On the other hand, the revised current OD table as of 2021 was updated based on the previous current OD table in 2008 to match the results of the cordon line survey and screen line survey conducted in this study. A comparison of trip demand among the pervious current OD table in 2008, the updated current OD table in 2021, and future OD table in 2025 (estimation based on 2008 table) is summarized below.

The growth rate of generated and attracted trip demand from each zone in 2021 is 2.03 times higher than demand in 2008. These growth of trip demand from suburban area of Kabul is higher than demand of central area which is correspondent to the urban sprawl situation in Kabul. While the growth rate in/near the center (zone no. 1 to 11, 13, 15, 16) is 1.52 times, the growth outside the center (zones 12, 14, 17 to 22) is 4.85 times. Total trip demand from outside Kabul city center increased 28% share of total demand in 2021 against only 11% share of demand in 2008.



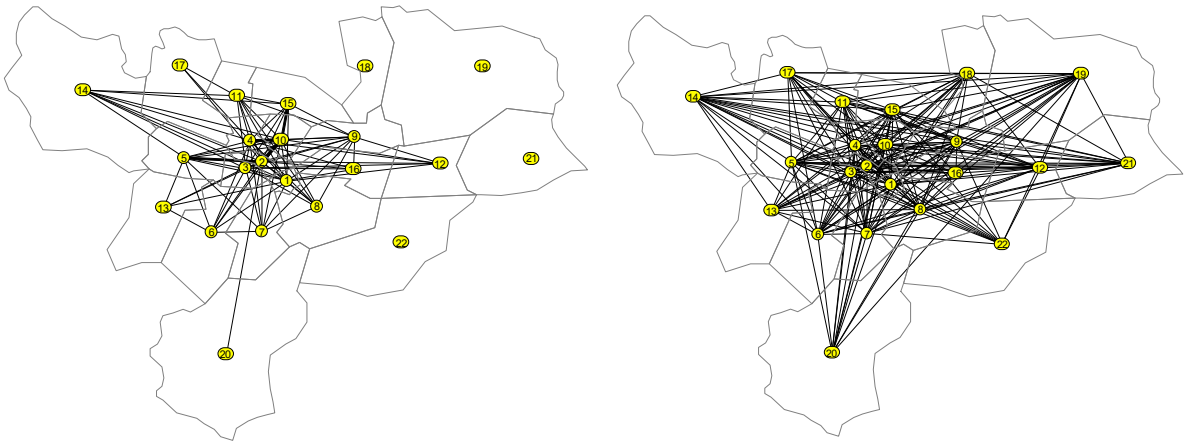
Source: JICA Study Team

Figure 4.5.13 Zone map



Source: JICA Study Team

Figure 4.5.24 Change of trip generation/attraction by zones



Source: JICA Study Team

Figure4.5.35 Change of trip generation/attraction by zones

4.6 Future framework and forecast of OD table

4.6.1 Future urban development scenarios

Rapid urban sprawl outside Kabul city center was confirmed from the observation of population and traffic demand from 2008 to 2021. As for the direction of future urban development in Kabul, it is generally expected that the urban area will sprawl toward outside of Kabul. However, it is also true that few land for living is left even at the outskirts of the Kabul. Under such condition and risk of over-crowded population in near future there was a plan to develop a new urban area in the Desab - Barikab area in the northern part of the existing urban area which has been supported by the JICA.

The following three types of urban development scenarios are considered as alternatives in this study. The "trend type" is a development pattern as same as current urbanized trend will continue. “High density type” is a development that urban renewal will be promoted at the city center along the proposed BRT line in future. "Suburban allocation type" is a development that urbanization outside the central area will be accelerated in terms of population flow by those who prefer cheaper living environment from rural area and other cities.

Table 4.6.1 3-Urban development scenarios

Scenarios	Outline	Employment location
Trend type	Current development pattern will be continue, i.e. population growth and urban area will be expanded according to the trend	No any major changes of employment locations from current situation
High density in CBD type	Assuming the high density development as same as most crowded district 10 level in the central area, i.e. zones (1 to 11, 13, 15, 16), according to the BRT and relevant development along the corridors.	It is assumed that employee in the central area will be increased according to high density development in there.
Suburban allocation type	New development will be progressed according to the open area capacity	No any major changes of employment locations from current situation

Source: JICA Study Team

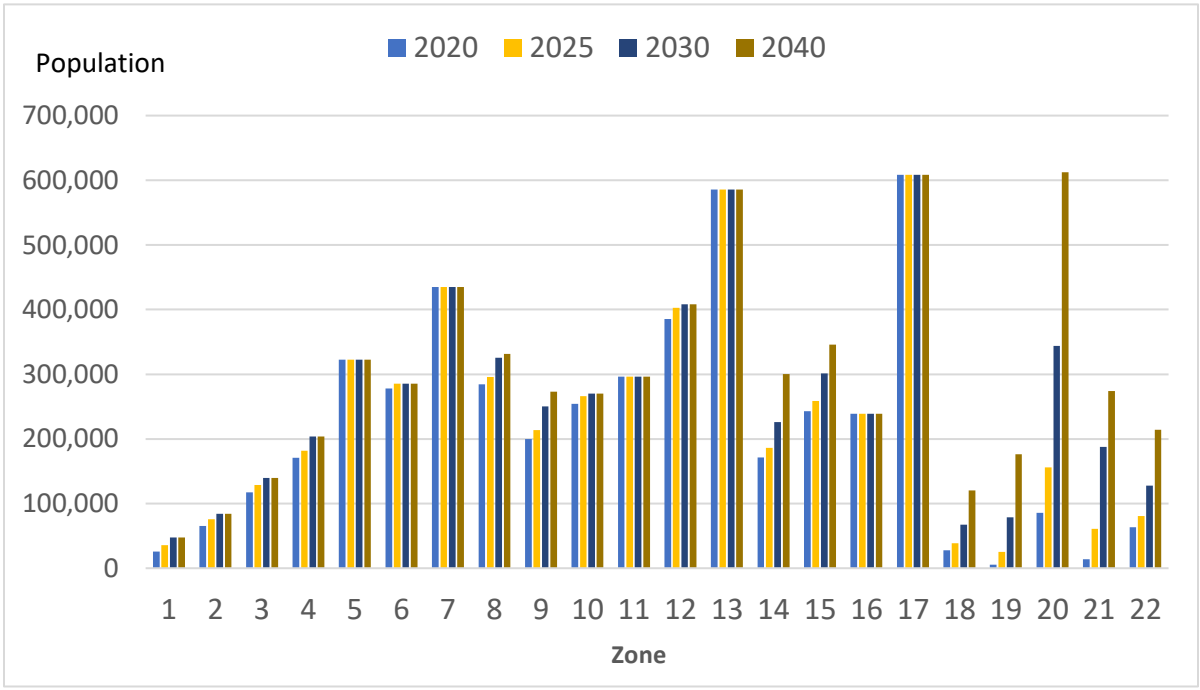
4.6.2 Future framework

In the development scenario of trend type, it is simulated that all of population density of every district will reach the average of entire Kabul area and the sealing population of each district is estimated based on the potential capacity by satellite image analysis. If increase of the population may exceed the limit of each district, surplus of the population will be shifted to other outside districts.

Table 4.6.2 Urban development scenario (trend type)

District	Population								
	M/P	Estimated				Density(/ha)			
	2008	2020	2025	2030	2040	Total	Urban2008	Potential	Max pop
Total	4,220,256	4,878,470	5,178,288	5,834,335	6,573,497	41.3	142.8	168.0	7,706,724
1	35,402	25,803	35,607	47,398	47,398	73.3	106.6	142.8	47,398
2	83,295	65,238	75,590	84,231	84,231	121.8	141.2	142.8	84,231
3	139,742	117,465	128,428	139,742	139,742	153.4	170.0	170.0	139,742
4	204,049	170,653	181,570	204,049	204,049	174.1	180.9	180.9	204,049
5	283,489	322,507	322,507	322,507	322,507	99.6	185.0	185.0	322,507
6	285,255	278,061	285,255	285,255	285,255	58.0	170.7	170.7	285,255
7	416,675	434,625	434,625	434,625	434,625	125.0	195.1	195.1	434,625
8	331,554	284,495	295,651	325,511	331,554	68.7	180.5	180.5	331,554
9	188,569	200,036	213,700	250,272	273,057	77.5	104.6	142.8	273,057
10	270,157	254,258	266,381	270,157	270,157	207.3	249.9	249.9	270,157
11	287,853	296,254	296,254	296,254	296,254	165.2	227.6	227.6	296,254
12	298,847	385,346	402,520	408,303	408,303	85.6	134.7	142.8	408,303
13	467,440	585,828	585,828	585,828	585,828	99.1	173.3	173.3	585,828
14	147,910	171,032	186,066	226,303	300,204	12.4	155.5	155.5	555,339
15	200,465	242,896	258,785	301,311	345,964	61.6	100.2	142.8	345,964
16	206,701	239,177	239,177	239,177	239,177	82.4	219.7	219.7	239,177
17	248,926	608,278	608,278	608,278	608,278	44.4	161.3	161.3	608,278
18	33,958	27,945	38,716	67,545	120,494	10.0	58.1	142.8	241,843
19	3,906	5,601	25,446	78,560	176,112	0.3	2.5	142.8	807,646
20	31,836	85,837	155,957	343,627	612,202	2.2	24.1	142.8	612,202
21	6,040	13,899	61,136	187,563	273,893	0.9	21.5	142.8	273,893
22	48,187	63,236	80,808	127,837	214,214	6.1	38.8	142.8	339,422

Source: JICA Study Team



Source: JICA Study Team

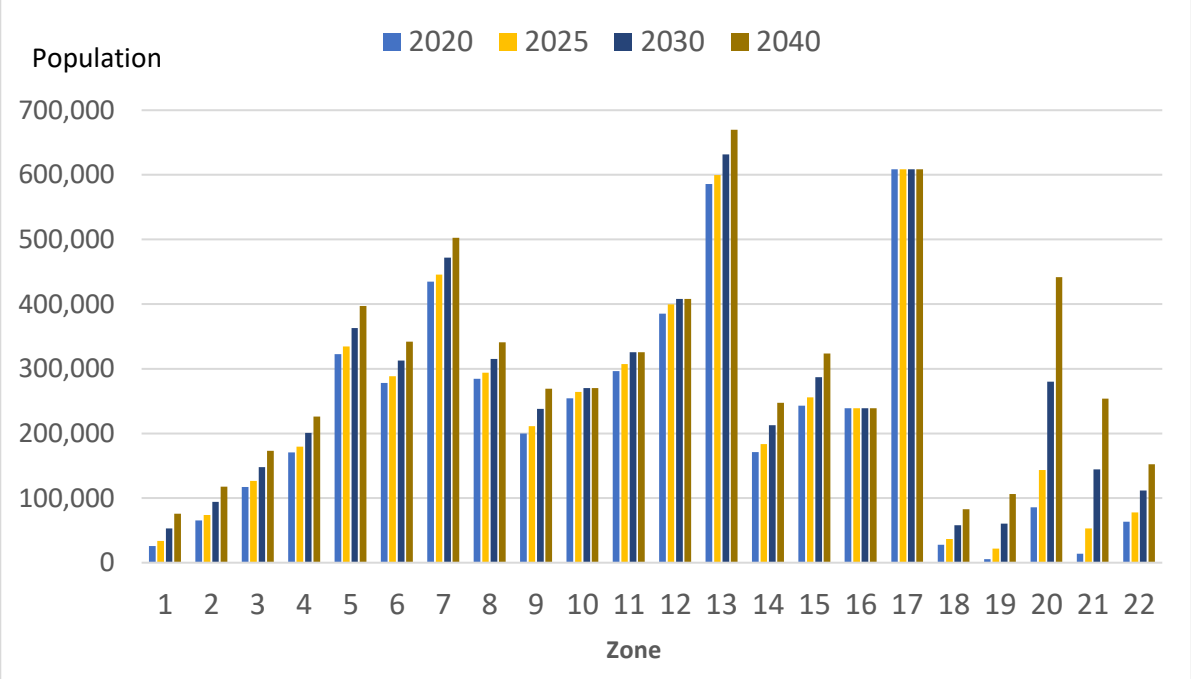
Figure 4.6.1 Change of trip generation/attraction by zones (trend type)

In the development scenario of high density in CBD type, it is simulated that population density of the districts in the central area will be increased to a similar level that can accommodate of district No.10. The sealing population of each zone will be assumed as same as trend type scenario. If increase of the population may exceed the maximum population of each district, surplus of the population will be shifted to other outside districts.

Table 4.6.3 Urban development Scenario (high density in CBD type)

District	Population								
	M/P	Estimated				Density(/ha)			
	2008	2020	2025	2030	2040	Total	Urban2008	Potential	Max pop
Total	4,220,256	4,878,470	5,178,288	5,834,335	6,573,497	41.3	142.8	206.1	8,937,454
1	35,402	25,803	33,898	52,955	75,559	73.3	106.6	249.9	82,971
2	83,295	65,238	73,785	93,908	117,775	121.8	141.2	249.9	147,449
3	139,742	117,465	126,516	147,826	173,102	153.4	170.0	249.9	205,429
4	204,049	170,653	179,666	200,886	226,055	174.1	180.9	249.9	281,903
5	283,489	322,507	334,689	363,371	397,390	99.6	185.0	249.9	435,564
6	285,255	278,061	288,412	312,783	341,689	58.0	170.7	249.9	417,606
7	416,675	434,625	445,709	471,803	502,752	125.0	195.1	249.9	556,813
8	331,554	284,495	293,706	315,392	341,114	68.7	180.5	249.9	459,092
9	188,569	200,036	211,318	237,879	269,382	77.5	104.6	249.9	477,996
10	270,157	254,258	264,267	270,157	270,157	207.3	249.9	249.9	270,157
11	287,853	296,254	307,184	325,368	325,368	165.2	227.6	249.9	325,368
12	298,847	385,346	399,525	408,303	408,303	85.6	134.7	142.8	408,303
13	467,440	585,828	599,504	631,701	669,890	99.1	173.3	249.9	845,039
14	147,910	171,032	183,444	212,667	247,327	12.4	155.5	155.5	555,339
15	200,465	242,896	256,015	286,900	323,532	61.6	100.2	142.8	345,964
16	206,701	239,177	239,177	239,177	239,177	82.4	219.7	219.7	239,177
17	248,926	608,278	608,278	608,278	608,278	44.4	161.3	161.3	608,278
18	33,958	27,945	36,838	57,776	82,610	10.0	58.1	142.8	241,843
19	3,906	5,601	21,985	60,560	106,313	0.3	2.5	142.8	807,646
20	31,836	85,837	143,729	280,028	441,689	2.2	24.1	142.8	612,202
21	6,040	13,899	52,899	144,719	253,625	0.9	21.5	142.8	273,893
22	48,187	63,236	77,744	111,899	152,411	6.1	38.8	142.8	339,422

Source: JICA Study Team



Source: JICA Study Team

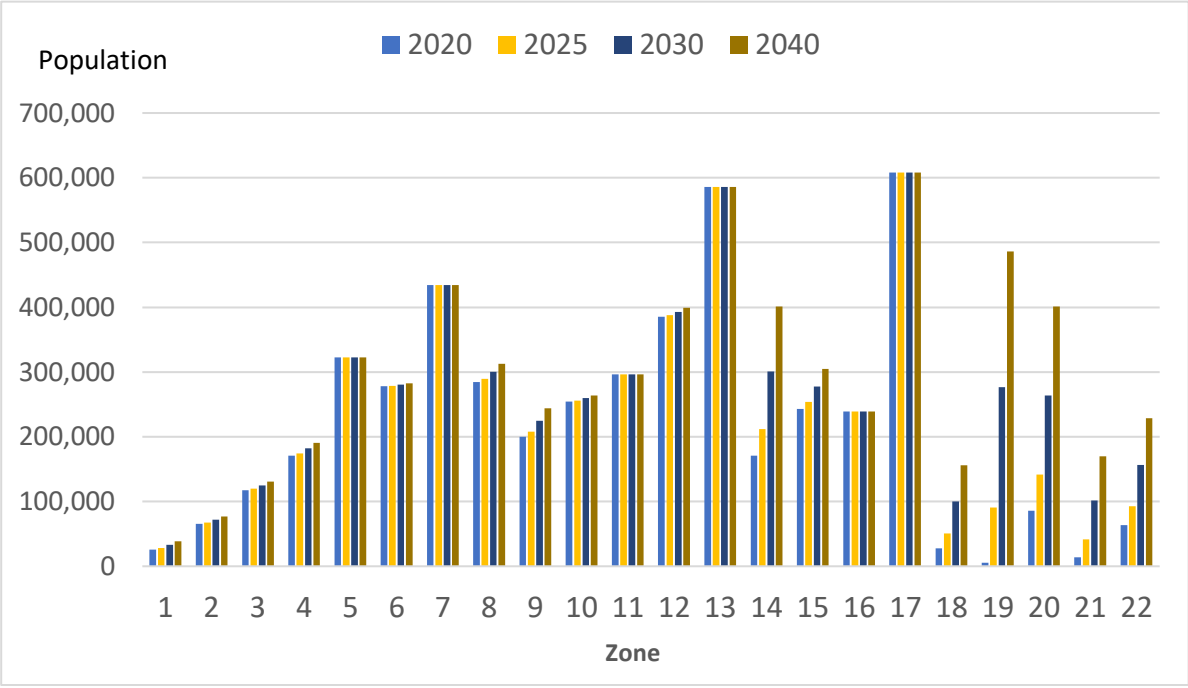
Figure 4.6.2 Change of trip generation/attraction by zones(high density in CBD type)

The simulation conditions such as population density and potential development area are same concept as trend type. Attraction of population inflow is more advantage for the districts which have wide potential development area.

Table 4.6.4 Urban development scenario (suburban allocation type)

District	Population								
	M/P	Estimated				Density(/ha)			
	2008	2020	2025	2030	2040	Total	Urban2008	Potential	Max pop
Total	4,220,256	4,878,470	5,178,288	5,834,335	6,573,497	41.3	142.8	168.0	7,706,724
1	35,402	25,803	28,092	33,101	38,745	73.3	106.6	142.8	47,398
2	83,295	65,238	67,251	71,657	76,621	121.8	141.2	142.8	84,231
3	139,742	117,465	119,827	124,994	130,816	153.4	170.0	170.0	139,742
4	204,049	170,653	174,193	181,940	190,668	174.1	180.9	180.9	204,049
5	283,489	322,507	322,507	322,507	322,507	99.6	185.0	185.0	322,507
6	285,255	278,061	278,824	280,493	282,373	58.0	170.7	170.7	285,255
7	416,675	434,625	434,625	434,625	434,625	125.0	195.1	195.1	434,625
8	331,554	284,495	289,484	300,400	312,699	68.7	180.5	180.5	331,554
9	188,569	200,036	207,777	224,715	243,799	77.5	104.6	142.8	273,057
10	270,157	254,258	255,943	259,631	263,786	207.3	249.9	249.9	270,157
11	287,853	296,254	296,254	296,254	296,254	165.2	227.6	227.6	296,254
12	298,847	385,346	387,780	393,105	399,105	85.6	134.7	142.8	408,303
13	467,440	585,828	585,828	585,828	585,828	99.1	173.3	173.3	585,828
14	147,910	171,032	211,772	300,916	401,354	12.4	155.5	155.5	555,339
15	200,465	242,896	253,822	277,730	304,667	61.6	100.2	142.8	345,964
16	206,701	239,177	239,177	239,177	239,177	82.4	219.7	219.7	239,177
17	248,926	608,278	608,278	608,278	608,278	44.4	161.3	161.3	608,278
18	33,958	27,945	50,620	100,236	156,138	10.0	58.1	142.8	241,843
19	3,906	5,601	90,624	276,668	486,282	0.3	2.5	142.8	807,646
20	31,836	85,837	141,636	263,732	401,297	2.2	24.1	142.8	612,202
21	6,040	13,899	41,460	101,769	169,718	0.9	21.5	142.8	273,893
22	48,187	63,236	92,514	156,579	228,760	6.1	38.8	142.8	339,422

Source: JICA Study Team



Source: JICA Study Team

Figure 4.6.3 Change of trip generation/attraction by zones (suburban allocation type)

The population share both the central area and suburban areas based on each urban development scenarios is as follows. While there is around 30% share of population for the Kabul Metropolitan Area in present, it will be shifted around 35% - 43% population share in 2040. In fact, increasing of the population shall be accommodated in outside districts even for all scenarios since many zones have no longer enough area to accommodate the large amount of population in future, so there is not huge difference among the three scenarios in future.

Table 4.6.5 Comparison among urban development scenarios

Scenario	Trend		High density in CBD		Suburban allocation	
Year	CBD	Suburban	CBD	Suburban	CBD	Suburban
2020	72%	28%	72%	28%	72%	28%
2025	70%	30%	71%	29%	69%	31%
2030	65%	35%	68%	32%	62%	38%
2040	59%	41%	65%	35%	57%	43%

Source: JICA Study Team

Comparing the results of every scenario described above, trend type scenario is adopted for the estimation of future OD matrix which is average case among the three cases.

4.6.3 Forecast of future OD table

Based on the future framework of trend type urban development scenario, future OD tables of 2025, 2030, and 2040 were estimated. Current OD table as of 2021 by vehicle trip based was simulated by controlling total generation and attraction volume estimated in framework as well as by parameters of average passenger volume by car classification in order to convert vehicle unit into a person trip.

Table 4.6.6 Future framework (trend type)

District	Population					Employment (parmanent)			
	M/P	Estimated				Estimated			
	2008	2020	2025	2030	2040	2020	2025	2030	2040
Total	4,220,256	4,878,470	5,178,288	5,834,335	6,573,497	1,677,400	1,819,998	1,978,597	1,999,240
1	35,402	25,803	35,607	47,398	47,398	173,717	239,722	319,104	319,104
2	83,295	65,238	75,590	84,231	84,231	134,050	155,321	173,076	173,076
3	139,742	117,465	128,428	139,742	139,742	56,702	61,994	67,455	67,455
4	204,049	170,653	181,570	204,049	204,049	60,377	64,239	72,192	72,192
5	283,489	322,507	322,507	322,507	322,507	61,223	61,223	61,223	61,223
6	285,255	278,061	285,255	285,255	285,255	44,075	45,215	45,215	45,215
7	416,675	434,625	434,625	434,625	434,625	56,092	56,092	56,092	56,092
8	331,554	284,495	295,651	325,511	331,554	120,291	125,008	137,633	140,188
9	188,569	200,036	213,700	250,272	273,057	105,349	112,545	131,806	143,806
10	270,157	254,258	266,381	270,157	270,157	47,772	50,050	50,759	50,759
11	287,853	296,254	296,254	296,254	296,254	31,934	31,934	31,934	31,934
12	298,847	385,346	402,520	408,303	408,303	56,352	58,863	59,709	59,709
13	467,440	585,828	585,828	585,828	585,828	52,400	52,400	52,400	52,400
14	147,910	171,032	186,066	226,303	300,204	87,422	91,318	92,630	92,630
15	200,465	242,896	258,785	301,311	345,964	33,118	35,284	41,082	47,170
16	206,701	239,177	239,177	239,177	239,177	56,966	56,966	56,966	56,966
17	248,926	608,278	608,278	608,278	608,278	98,488	102,877	104,355	104,355
18	33,958	27,945	38,716	67,545	120,494	66,225	69,176	70,170	70,170
19	3,906	5,601	25,446	78,560	176,112	80,375	83,957	85,163	85,163
20	31,836	85,837	155,957	343,627	612,202	76,716	80,135	81,286	81,286
21	6,040	13,899	61,136	187,563	273,893	96,721	101,032	102,484	102,484
22	48,187	63,236	80,808	127,837	214,214	81,035	84,647	85,863	85,863

Source: JICA Study Team

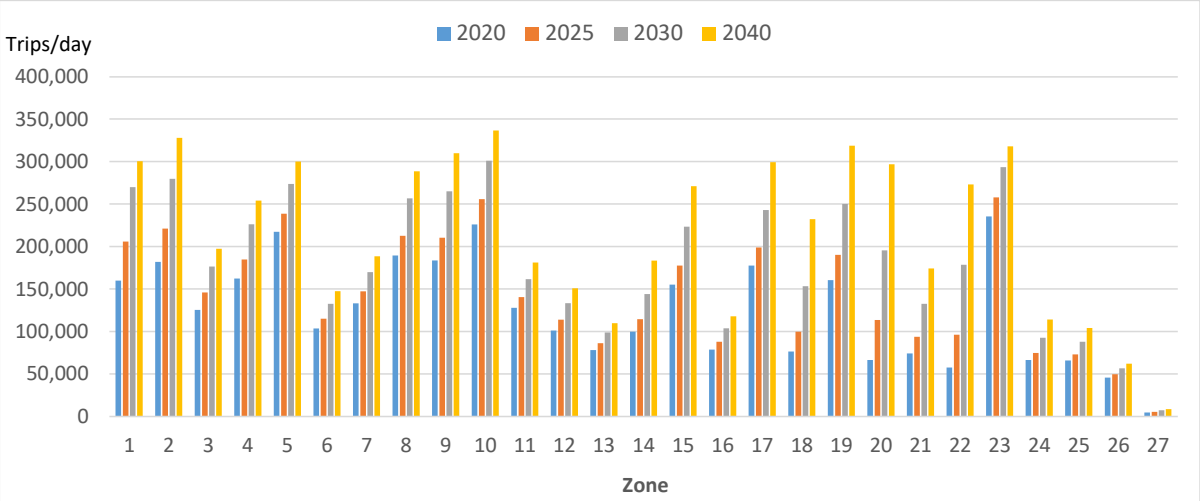
Table 4.6.7 shows changes in generated and attracted person trip volume (volume excluding walking: person-based) by districts for each targeted year. It is estimated that the total trip volume in 2025 will increase to 1.17 times from the current level, 1.46 times in 2030 against the current level, and 1.75 times in 2040 for the current level.

As for the characteristics of increasing of trip volume by each zone, while urban area will be sprawled for outside and the population is growing rapidly in the suburban area, trip volume from central area, i.e. zone No. 1, 2, 8, 9, and 10, will be also increased as well according to growth of number of employee in central area. It is expected that trip demand from/to the north part of existing urban area will be increased.

Table 4.6.7 Estimate of future OD table (trend type)

Zone	2020	2025	2030	2040
1	159,865	205,832	269,966	300,495
2	182,042	221,154	279,616	327,924
3	125,442	145,971	176,471	197,622
4	162,399	184,938	226,367	254,206
5	217,442	238,533	273,823	300,169
6	103,524	115,184	132,627	147,629
7	133,213	147,238	169,814	188,737
8	189,546	212,794	256,778	288,556
9	183,594	210,384	265,152	309,938
10	225,990	255,856	301,026	336,758
11	127,892	140,603	161,558	181,094
12	101,138	113,937	133,564	151,105
13	78,372	86,354	99,026	109,751
14	99,809	114,350	144,164	183,458
15	155,417	177,696	223,326	271,239
16	78,885	87,909	103,902	117,814
17	177,784	198,842	242,849	299,271
18	76,444	99,691	153,370	232,338
19	160,536	190,367	250,015	318,868
20	66,492	113,636	195,652	296,956
21	74,372	93,750	132,713	174,309
22	57,632	96,434	178,425	273,249
23	235,430	257,990	293,457	317,995
24	66,411	74,701	92,503	114,301
25	65,841	73,129	88,132	104,114
26	45,915	49,693	56,701	62,259
27	4,772	5,602	7,150	8,735
Total	3,356,199	3,912,568	4,908,147	5,868,890
Growth	1.00	1.17	1.46	1.75

Source: JICA Study Team



Source: JICA Study Team

Figure 4.6.4 Change of trip generation/attraction by zones by year (trend type)

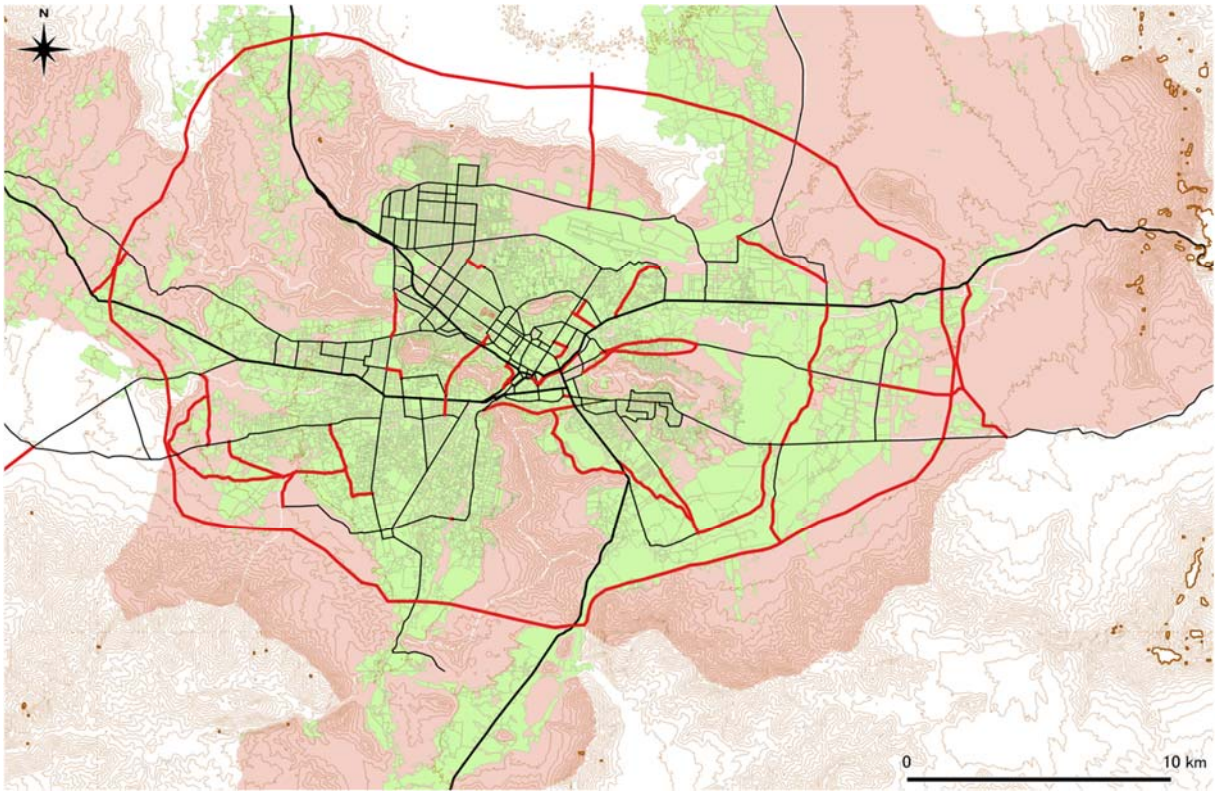
Chapter 5 Challenges on urban transportation sector in Kabul Metropolitan Area and direction to improve

5.1 Challenges on urban transport sector

5.1.1 Challenges on road network and transportation infrastructure

Roads in Kabul City radiate outward from the center of the city. Very few of the transportation routes running through the city in north-south and east-west directions bypassing streets in the central district. Along with this, geographical constraints in the region such as mountains and rivers have inevitably led to the formation of a limited road network (with missing links between roads) leading to congestion. Traffic becomes heavily concentrated at specific points, and bottlenecks and severe gridlocks easily occur at many intersections and bridges.

In addition, a major issue is the fact that many of the gaps in sections of roads cannot be completed and spaces (missing links) between roads and bridges cannot be connected due to mountainous topography.



Source: JICA Study Team

Figure 5.1.1 Study areas for road network and transportation infrastructure development

5.1.2 Challenges on public transportation services

Public transportation services in Kabul City are mainly provided by buses. There two categories of bus services, the Milli Bus managed by the Afghanistan Ministry of Transport (MOT) and those provided by private operators (companies and individuals). Public bus service in the city was once (over thirty years ago) comprised of 54 lines by approximately 1,000 vehicles. By 2008, the number of buses had shrunk to about 360, with no more than 100 buses running on four of the main roads extending from the central district. Current data indicates that this number has further decreased. The weakening of transport capacity is a serious

problem. It is also pointed out that services are also plagued with various problems including poorly maintained vehicles, lack of schedules, and absence of punctuality. The transportation capacity of the public buses is insufficient, and coordination with private buses (provided mostly by individual operators) is necessary, but the vehicles run by private operators are in worse condition than the public buses are. Private buses are generally small in size, which means they are low in efficiency and add to environmental problems. The lack of clarity in the allocation of roles played by public and private buses is another issue.

There are many organizational problems including the following: no regulation of transport operations, which means the status of the services is vague; even though service has greatly decreased, the number of employees remains great, which means the management system is inefficient; and organizations cannot be easily reenergized because elderly workers account for a high percentage of the work force.

5.1.3 Challenges on traffic management

Several external factors contribute to the large drop in basic transportation capacity of road infrastructure in Kabul City. Drivers cut into lines of traffic moving through intersections; others drive against the flow of traffic. Disorderly, careless driving and illegal parking along roads are among the other problems. Jaywalking, in which cars and pedestrians are entangled, is everywhere and is another issue. Poor traffic manners and lack of education are viewed as causes of such problems, which combined with geometric and structural factors, have led to the city's chaotic traffic situation.

Further complications arise from electric power failures, broken traffic signal equipment at many intersections, and confusing rules regarding one-way streets.

5.1.4 Challenges on organizations and institutions

A new department has been created in Kabul City for the transportation planning, but it is said that it is staffed by a younger generation with only a few years of experience. This leads to lack in knowledge and capabilities that come with actual work experience. Large numbers of non-technical personnel (such as transportation supervisors) have been hired or are registered to be hired, but positions where they can show their capabilities have not been secured. This has been pointed out as a confusion that arises when a new organization is launched.

In a situation in which problems with manners and rules pertaining to auto traffic and pedestrians lead to frequent traffic jams, strengthening traffic management and control is the responsibility of traffic police. A major problem is that this primary function continues to be neglected. Previously it was performed by Kabul City and the Interior Ministry in an arrangement in which administrative jurisdictions were vague. As a result of discussions between the two entities, a temporary agreement was reached to put all Kabul City's traffic police in charge. However, according to local staff, the system has reverted to administration by both organizations, and the management situation continues to be unclear.

5.2 Needs for improving urban transportation system

In the course of identifying the issues outlined above, Kabul City personnel confirmed that they had similar concerns in an online consultation. Kabul City sees urgent to respond with short-term improvements in transportation. The following are the most pressing needs identified:

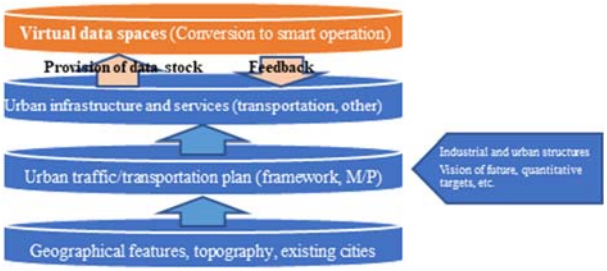
- Revision of the JICA M/P (revise for coordination with the KUDF)
- Improvement of facilities at intersections to eliminate traffic bottlenecks (together with widening, other redevelopment work in blocks along the roads)
- Training and development of personnel in departments concerned with urban transportation planning
- Education and reassignments of the approximately 300 non-technical personnel in transportation supervisory positions, etc. (for effective utilization of human resources).

Similarly, the following medium-term urban transportation needs must be met:

- Support for the early introduction of public transportation (BRT) (with eastern district of Kabul City as a priority)
- Support for provision of ring roads (belt line highways)
- Elimination of traffic bottlenecks (at bridges and intersections)
- Fill in the gaps in roads to eliminate missing links
- Support for traffic (transportation) safety improvements.

Large amounts of time and money will be required in providing and maintaining roads, which is why it is decided that short-term and medium-term measures (on the software side) are necessary to alleviate bottlenecks, while working conditions are prepared and new systems are developed for long-term measures to provide material (hardware) infrastructure improvements (including improvement of public land) for roads and transportation services.

In this regard, shifting to smart operation with the use of digital technology and ICT is the way forward. For development of road infrastructure in difficult environments, designing roads that can effectively handle a maximum of transportation functions is a great challenge. In view of the present situation in Kabul, it is best to consider what is possible and at the same time needed. Partial measures, including pilot programs, can be introduced and positioned as short-term actions as preparations are made for medium- and long-term transportation solutions. CCTV cameras can be used to provide traffic information, and bus location systems can be used to gather big data related to bus operations. The data collected can be effectively used in anticipation of shifting to smart operation in the future. It is important that development proposals take this into account. Chapter seven will present examples of how this approach has been used in other parts of the world.



Source: JICA Study Team

Figure 5.2.1 Vision of future introduction of smart solutions

5.3 Coordination with JICA's support policy

The JICA support plan for Afghanistan, which proposes futuristic technologies in the urban transportation field, offers the following three features:

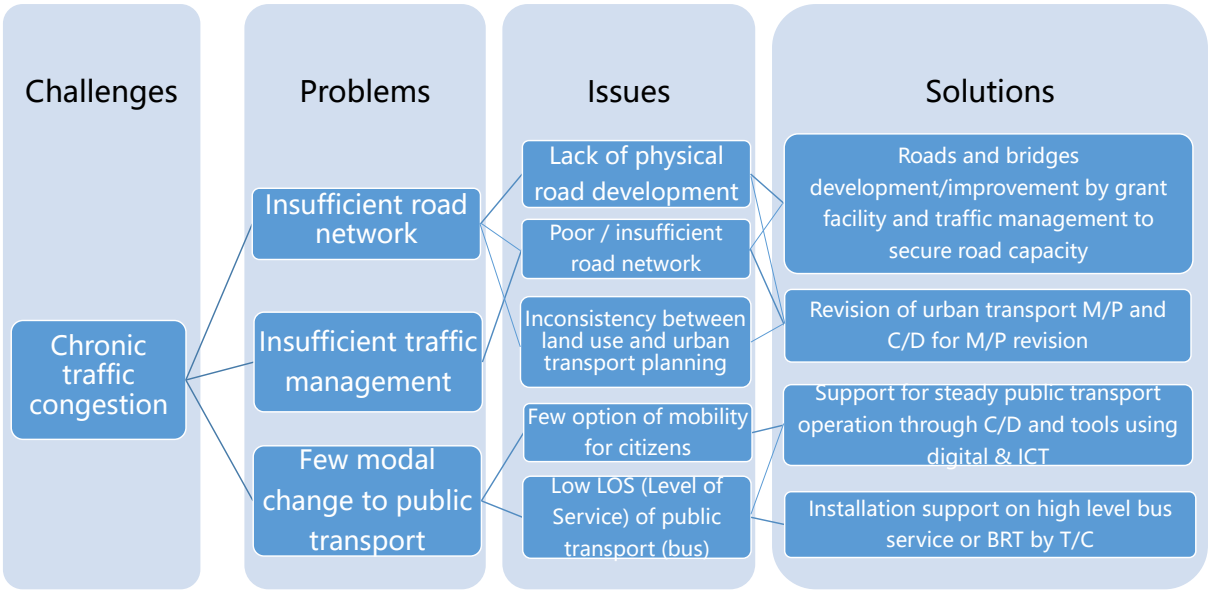
- It is designed to eliminate bottlenecks and make inner-city traffic run smoothly
- It proposes a modal shift to public transportation
- It is designed to improve road networks in the country's urban areas.

Japan's plan for cooperation with Afghanistan's national development is based on three main principles, one of which is to support sustainable, independent national development by providing infrastructure. Additionally, the JICA Country Analysis Paper (JCAP) positions the provision of infrastructure as a key element in Afghanistan's development. Within this, as an important task requiring immediate attention, the plan addresses the need to alleviate the chronic traffic congestion in Kabul City that has accompanied rapid population growth. Up until now, JICA has provided technical assistance in construction, management and maintenance of roads and bridges as part of the effort to mitigate traffic bottlenecks in Kabul City, and JICA has provided support for the Kabul Master Plan, which includes proposals for transportation management

and BRT in order to introduce effective public transportation as a necessary component of urban development.

5.4 Direction and framework of JICA's support to improve urban transportation system

The greatest transportation problems Kabul City faces are chronic traffic jams. The flow of measures proposed to solve this issue are set forth below. Improvement and construction of roads, intersections, and bridges are proposed to alleviate bottlenecks; this includes hardware-oriented infrastructure development along with transportation management measures to be supported with grants and technical assistance. The cooperation, including work on studies, is designed to meet the pressing need for a revised master plan and the best possible operation and management of transportation services. This includes support for making full use of digital technology and the introduction of BRT/BHLS. Much can be expected from the technical cooperation projects being proposed.



Source: Prepared by the Study Team

Figure 5.4.1 Policy of JICA's support for improving urban transport sector

Urban transportation tasks involve work in various fields. For this reason, a framework for planning and a multifaceted approach will be needed to solve the problem of traffic jams in Kabul City. As indicated in Figure 5.4.1, what is needed are (1) a city plan (for land utilization/city structure) and a transportation plan. The plan includes: (2) provisions for transportation infrastructure and services; (3) provisions for transportation/traffic management, and for efficient and effective implementation; and (4) comprehensive improvements in organizations and systems.

With the exception of parts of the Kabul City infrastructure plan such as ring roads (belt highways in suburban areas where ongoing urbanization is expected), the conditions are very difficult for new construction of large-scale road infrastructure. Therefore, to solve

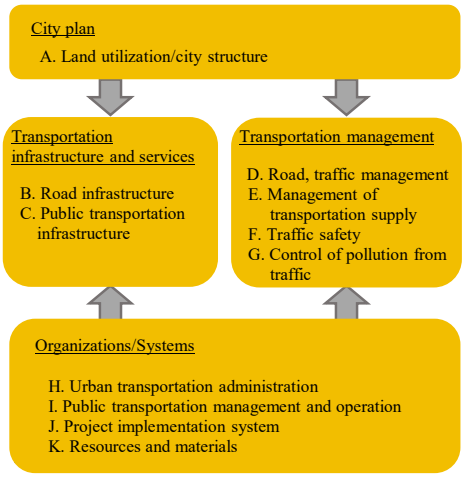
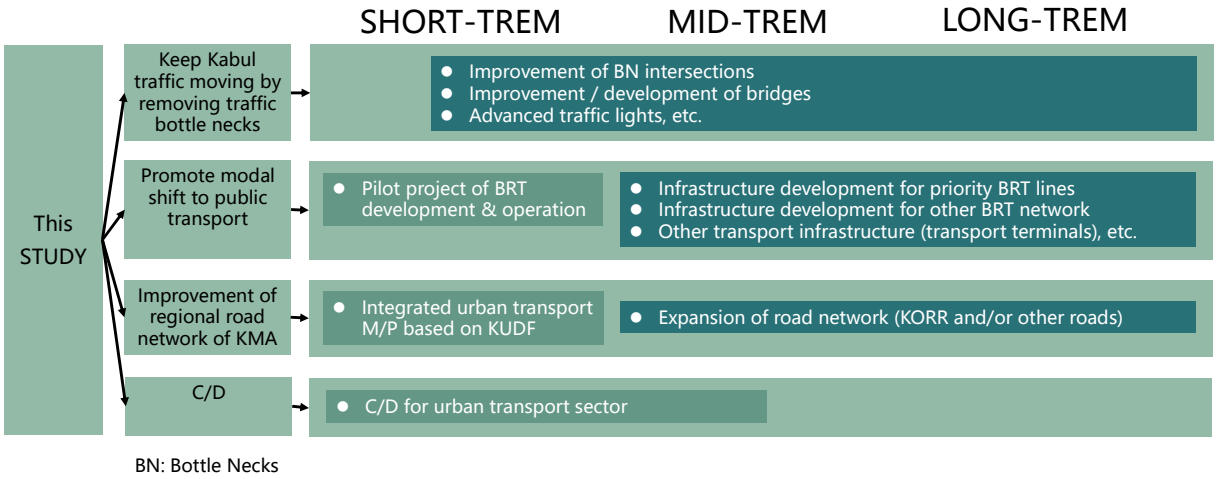


Figure 5.4.2 Composition of urban transportation master plan

problems such as those outlined above, it is important to strengthen public transportation (such as bus services) while cutting down (discouraging) automobile use. Overall governance must be strengthened to enable the type of transportation management required. Management systems conforming to plans for future development of urban regions (urban utilization/urban structures) are required to maximize road infrastructure capacity.

A support concept with a time frame and in line with the three objectives proposed for the field of urban transportation is presented below.



Source: JICA Study Team

Figure 5.4.3 Framework for short-term, mid-term and long-term JICA's support

Chapter 6 Direction of support plan for short-term period

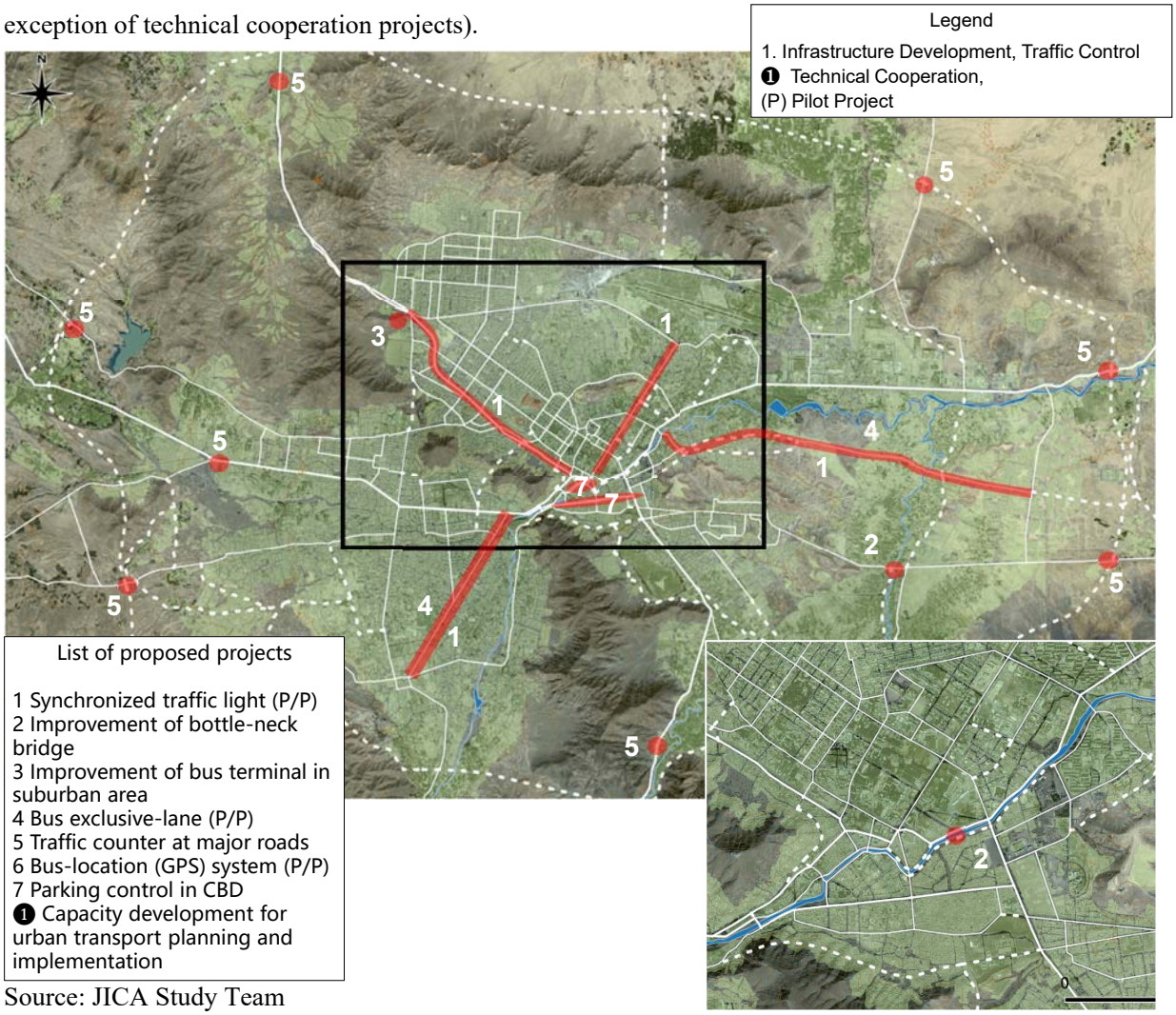
6.1 Direction of support for short-term

As outlined in Chapter 5, along with securing land for highway infrastructure construction projects, the short-term cooperation plan includes software-oriented projects involving digital technology and ICT that are easy to introduce for transportation management. Also included are proposals for updating the city transportation master plan, establishing a new agency in Kabul City for urban transportation planning, which will be responsible for capacity development, and a pilot project for supporting BRT operations in priority districts. The latter half of the plan covers items in technical cooperation projects, among which are core projects in JICA's short-term cooperation plan, which it is hoped will be implemented. It is expected that these technical cooperation projects will be quickly carried out, which is why they are explained in detail in Chapter 8.

6.2 Specific plans for short-term

6.2.1 Specific positioning of projects

The figure below shown the locations of specific projects proposed as short-term measures (with the exception of technical cooperation projects).

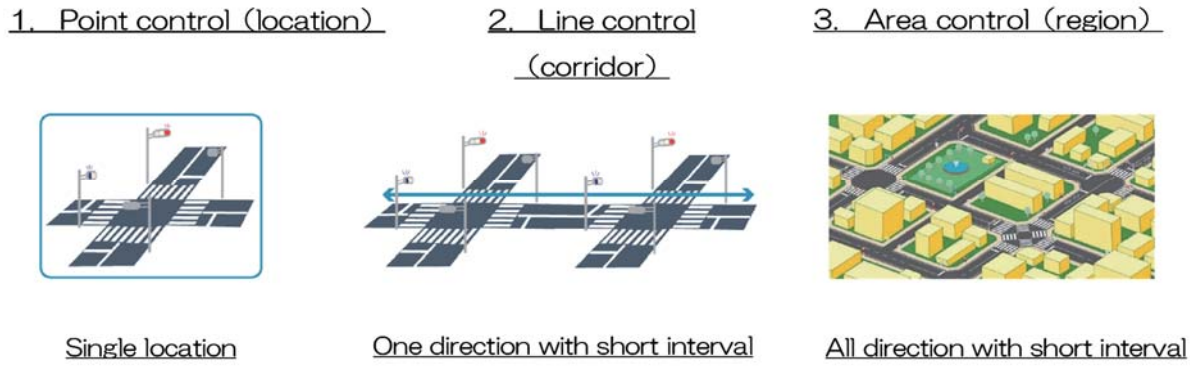


Source: JICA Study Team

Figure 6.2.1 Location of proposed projects for short-term

6.2.2 Introduction of advanced traffic lights

It is assumed that the signals installed in Kabul City are the types that function independently of other signals. Here, the type proposed for transportation management will be set up at intersections to operate in a continuous regular manner — each signal will be part of a set section of a given bus route (as a unit in an interlinked route-control system). Each signal machine is linked to others in the system. This is proposed as an optimal processing system for traffic management. Installation of the route-control system for BRT and other public transport services is expected to serve as the most effective way to manage each system. BRT service is prioritized for Darulaman Road and Ahmad Shah Baba Road (see Figure 6.2.1); or it can be envisioned for service in sections where smooth traffic flow is desired such as Airport Road to and from the center of the city, or Salang Road leading to the densely populated Sarai Shamali district.



Source: JICA Study Team

Figure 6.2.2 Typical control types of traffic lights

Source: Google Earth

Figure 6.2.3 Candidate roads for introduction (Airport Road and Salang Road)

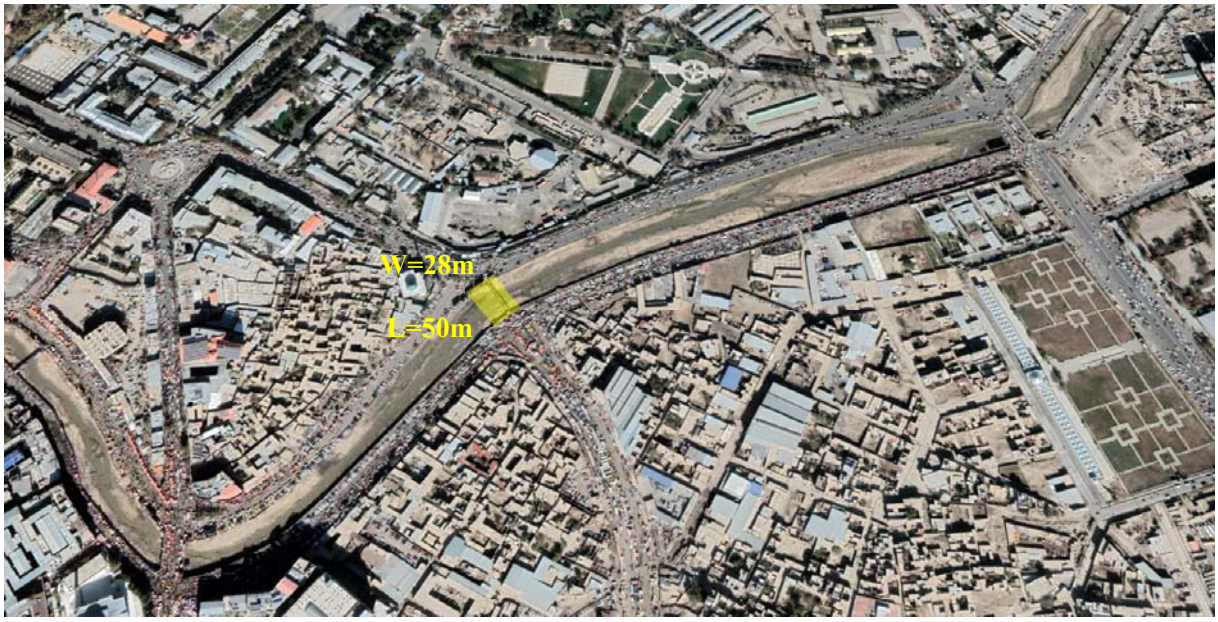
6.2.3 Rehabilitation of bottleneck road bridges

Located on Jalalabad Highway connecting central Kabul and Jalalabad district, Bagrami Bridge is a bottleneck with chronic congestion since the four-lane highway for both way traffic becomes a two-lane carriageway on the bridge. There is few obstacles along the bridge where it crosses the river. Therefore, widening the bridge (additional lanes) is not difficult at this location.

Source: Google Earth

Figure 6.2.4 Bagrami Bridge

Another potential solution is building a bridge crossing Kabul River in the central part of the city. Both banks of the river have T-junctions which does not connect mutually (missing links). It is necessary, however, to consider revised traffic control system since heavy traffic concentrate at the area and complicated traffic control has been adopted due to one-way road network area.



Source: Google Earth

Figure 6.2.5 New bridge crossing Kabul river

6.2.4 Renovation of bus terminal in suburban area

There are ten main bus terminals in Kabul, mostly in open public spaces, which are merely roundabouts and intersections. Vehicles stopping at these locations block traffic and cause of bottlenecks.

However, it is envisioned that these main bus terminals will become BRT stops once construction of BRT is developed and the futuristic service begins. To prepare for this, it is proposed that off-street bus terminals be set up to serve as stops during the early stage of construction. While almost all of the ten main terminals are in the central part of the city, the Sarai Shamali Bus Terminal is located in a suburban district, at a key transportation point where the road enters Kabul's northern region. Compared to the central part of Kabul, a comparatively large amount of usable land remains on the outskirts of the city, which means spaces exist where new bus terminals can be built.

Bus terminal areas can also function as spaces for management, parking spaces for employees, and as spaces for waiting rooms for passengers. Buildings there can be rented to tenants and used for management offices. Spaces can also be created for facilities for quick vehicle maintenance and for other transportation functions such as transfer points for riders switching to taxis or other buses.

Source: Google Earth

Figure 6.2.6 Sarai Shamali located in suburban area where a bus terminal could be developed

6.2.5 Development of exclusive bus lanes

In the BRT preparation project, KUDF highly prioritizes Darulaman Road, which has two lanes on each side, a median strip, and service roads. The current road configuration has ample width for establishing exclusive BRT lanes. The space now used for the service roads and median strip will have to be used (cut into) to provide for the future exclusive lanes for BRT. However, in the short-term, when the pilot project starts, the service road spaces can be used for exclusive BRT lanes or the two center lanes can be established for provisional BRT use. For now, it is important that Kabul citizens be made aware of how the BRT system will work, and it can be envisioned that experimental operation of this social service can be undertaken.

Source: Google Earth

Figure 6.2.7 Development of exclusive BRT lanes on Darulaman road

6.2.6 Automated traffic monitoring system along arterial roads

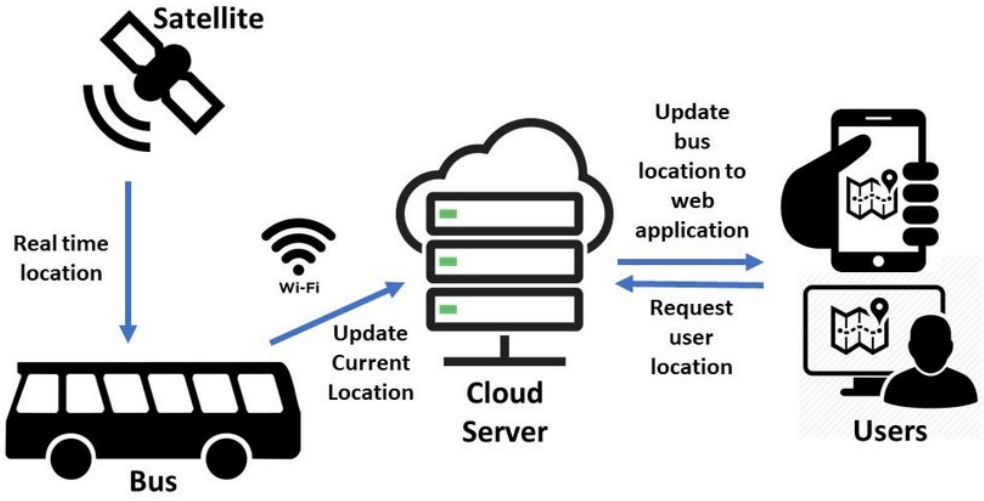
Checkpoints for security inspections are set up along corridors leading to Kabul City areas. Some of these locations also serve as monitoring stations for large trucks. Future automation and a reduction of personnel stationed at these sites can be considered along with providing greater safety for inspectors. With possible automation in mind, installing CCTV, etc. to use television cameras for monitoring can be considered, and it is proposed that automated traffic monitoring systems be installed as this is done. Setting up monitoring installations at intersections where each of the traffic corridors radiating outward from the city center connect with Kabul ring roads is also envisioned.

Operation when installation starts can take the form of using real-time camera images taken manually from remote positions used for monitoring. Later, image data can be used to analyze traffic flows and traffic behavior (speed, etc.) for each class of vehicle. When software for automatic differentiation is introduced, the data can be used for checking vehicle speeds, traffic control, monitoring the influx of large vehicles, checking for overloading of vehicles, and monitoring the inflow of traffic into the city.

An additional need will be a traffic control center for concentrated management of these systems. For immediate needs, servers with displays in designated offices can be used for the monitoring.

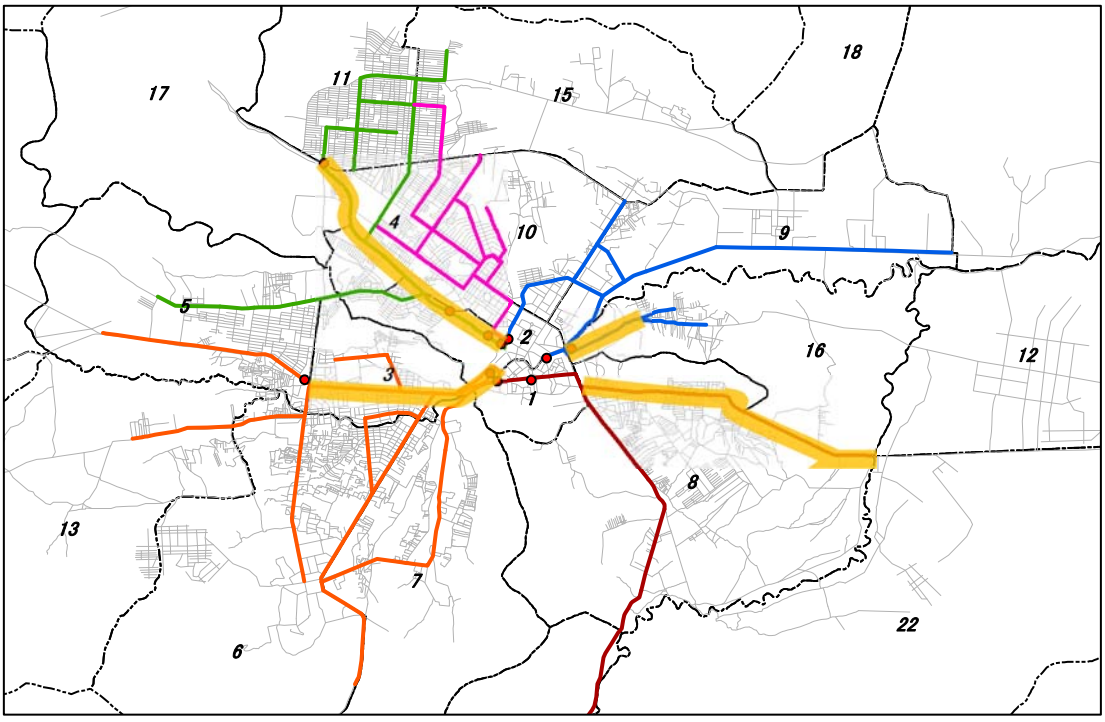
6.2.7 Introduction of bus location systems

Currently, bus location systems have become a popular tool used all over the world to provide data used to support management of bus operations. City operators are making full use of these systems, which are easy to install, as they convert to smart management. The public bus service plans to introduce such system for four lines with 50 to 100 vehicles under management.



Source: International Colloquium on Signal Processing and its Applications

Figure 6.2.8 Image of proposed bus location system

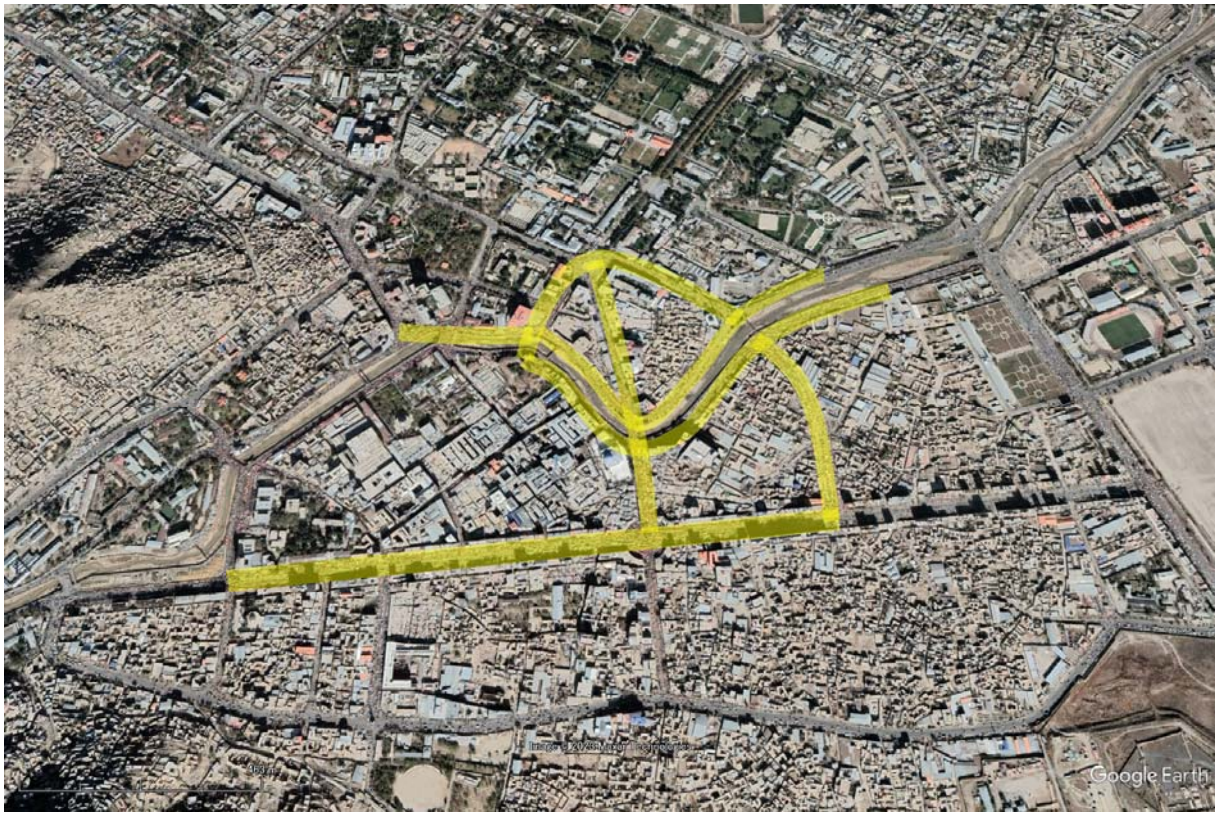


Source: Kabul Metropolitan Area urban Development Master Plan 2009

Figure 6.2.9 Targeted four bus lines to introduce bus location system

6.2.8 Parking vehicles management system in Central Business District (CBD)

Currently, areas along the Kabul River in the central part of the city are plagued by chronic traffic jams. Fairly wide area sections of roads are being used for parking. A plausible solution is to employ non-technical personnel to monitor the situation in these areas and enforce controls to eliminate inappropriate parking.



Source: Google Earth

Figure 6.2.10 Targeted areas for parking vehicles management system

6.3 Remarks on direction and support plans for short-term

The following are points to be aware of when carrying out the short-term measures discussed up until now:

- When discussing each of the programs, particularly when the cooperation supporting a project is in the form of a grant, it is necessary to be aware that highly accurate cost estimation will be required at an early stage.
- A menu of many different items will be involved in planning road infrastructure work, support for public transportation, traffic control, and other such projects. This means methods will have to be worked out to devise fair, objective and understandable evaluations of priorities. Consideration must be given to conducting baseline studies when needed to prepare for such evaluations beforehand.
- BRT development in priority areas, creating bus terminals in suburban areas, and installing traffic signals with advanced functions are closely interrelated, which means it is important to develop proposals that maximize benefits from synergies when several such projects are undertaken.
- Several systems for signal machines exist, which means full attention must be given to enhancing driver convenience and safety when selecting the type of signal to be used. In addition, the systems will be installed where the electric power supply situation is not good. Accordingly, consideration must be given

to securing a system which makes a stable supply of power possible, and providing backup delivery systems.

- It is necessary to proceed with bridge improvement and construction work in a way that avoids interfering with transportation. Careful attention must be given to this point when work is to be done in areas with heavy traffic.

Chapter 7 Direction of support plans for medium-term period

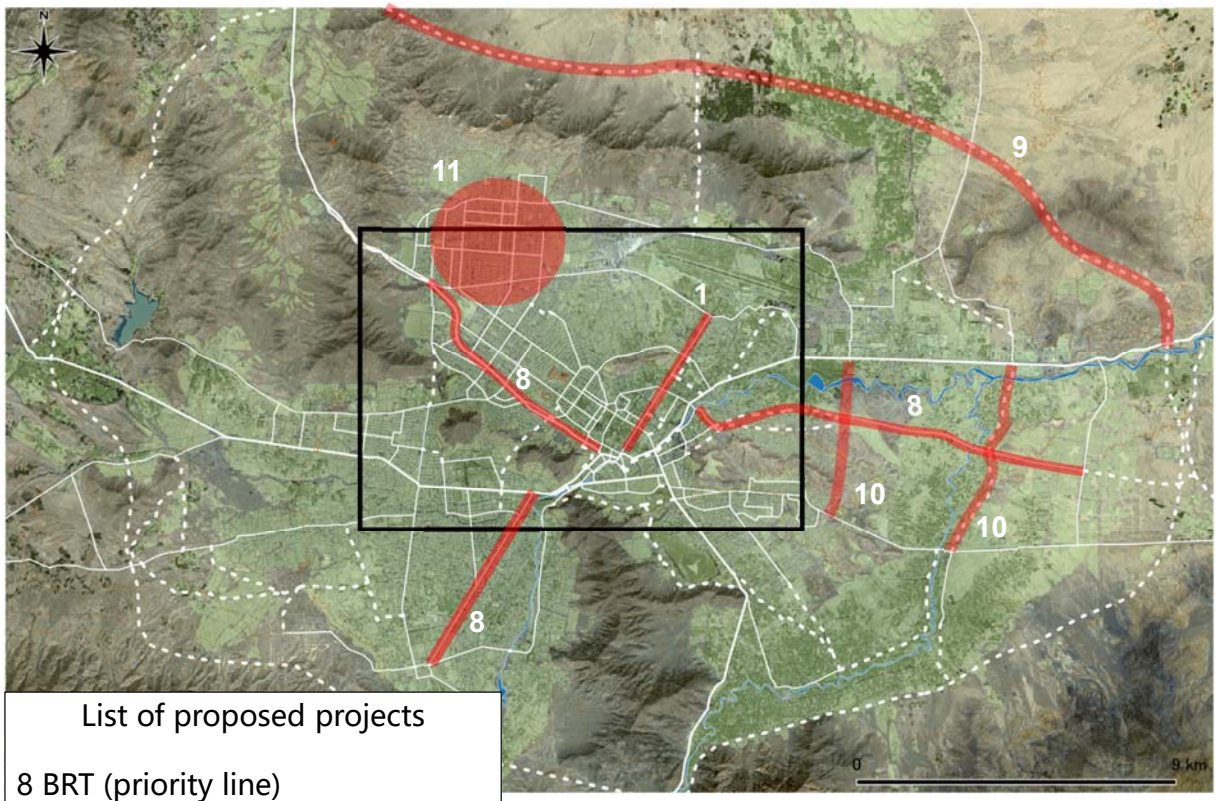
7.1 Direction of support for medium-term

Road infrastructure projects are relatively large in scale, and a substantial amount of time is required for discussion and study when carrying them out. In addition, the main point in preparing the infrastructure needed for full BRT/BHLS operation will be strengthening the bus network. Also, digital ICT, which is increasingly being applied in traffic management worldwide, will be fully used. Support will be provided for developing proposals for possible solutions for issues that will be faced in Afghanistan, particularly in Kabul.

7.2 Specific plans for medium-term

7.2.1 Positioning of specific projects

The figure below shows the locations for specific projects, which are proposed in medium- and long-term programs (with the exception of technical cooperation projects).



List of proposed projects

8 BRT (priority line)
9 KORR (priority section)
10 Missing roads development
11 Improvement for municipality roads and community roads
12 Data center
❷Capacity development for traffic data utilization

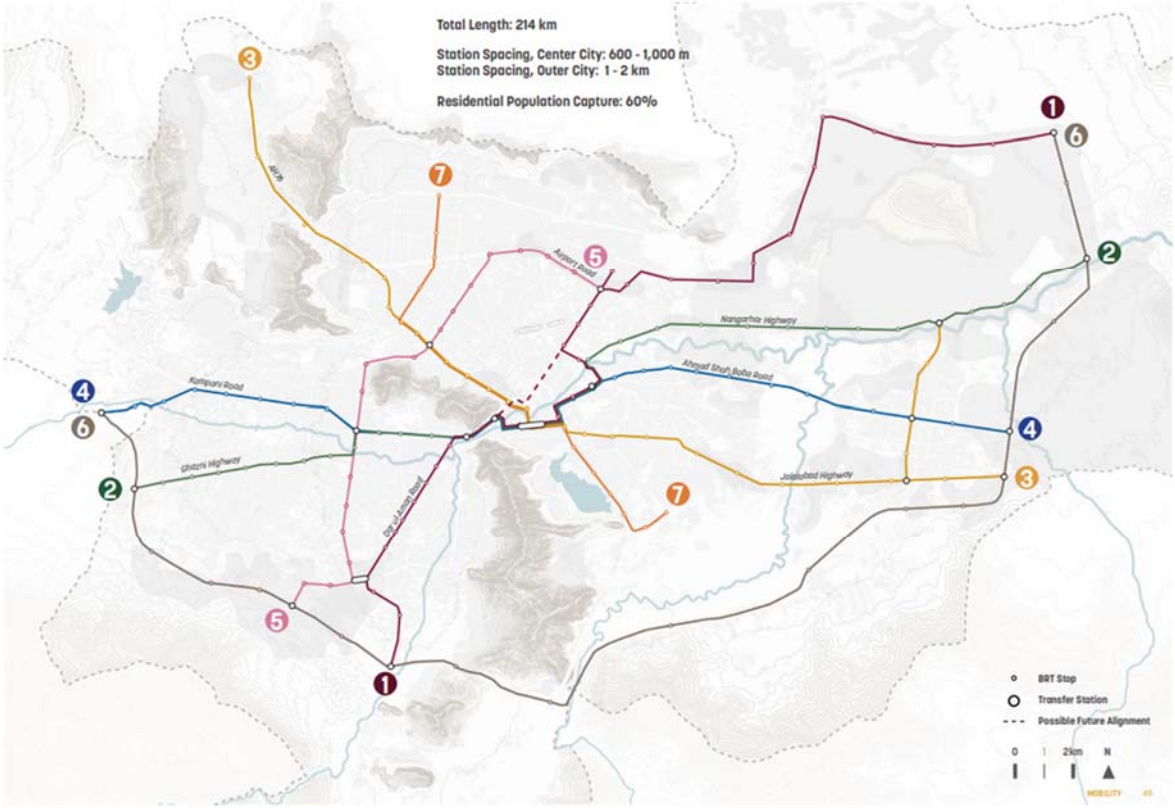
Legend
1. Infrastructure Development, Traffic Control
❶ Technical Cooperation,
(P) Pilot Project

Source: JICA Study Team

Figure 7.2.1 Location of proposed projects in medium-term

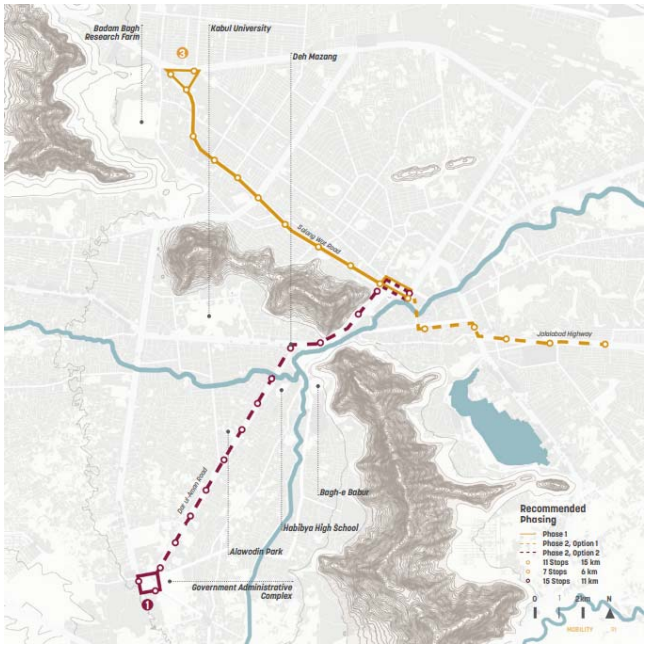
7.2.2 Provision of BRT infrastructure

As part of a short-term program with an eye toward full operation, improvement work will be carried out in designated high-priority sections to create exclusive BRT lanes. KUDF forecasts indicate that during peak hours 14,000 to 25,000 riders will be traveling in one direction on Line 1 and Line 3, which have been designated as priority lines.



Source: KUDF

Figure 7.2.2 BRT network lines proposed in KUDF



Source: KUDF

Figure 7.2.3 High-priority sections of BRT lines in KUDF

7.2.3 Kabul outer ring roads (priority section)

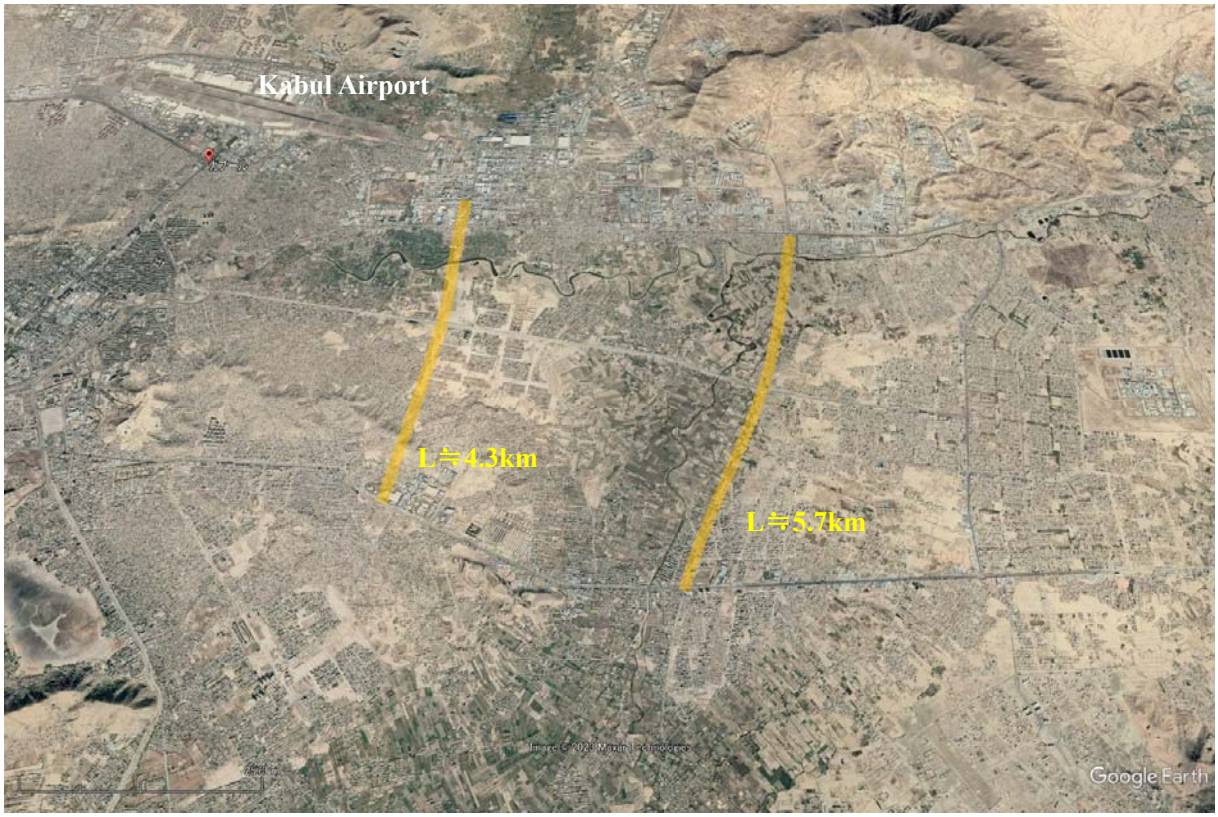
Plans of Kabul outer Ring Road (KORR) have been studied with the support of World Bank funds in 2007 for Pre-F/S and in 2008 for full F/S. The total length is significant, and the areas the ring road will pass through include difficult terrain, which makes expected project costs high. Nevertheless, the volume of traffic projected is not that large. The projects have not moved forward at all. Still, development of KORR is expected to have the following effects:

- A network of ring roads extending from the urban area will form a framework for the Kabul City area.
- Traffic passing through central Kabul will be eliminated; this will alleviate the concern of the traffic flowing into the city; and traffic congestion in the central parts of the city will be mitigated.
- The roads will provide improved, direct access to neighboring satellite areas; excessive concentration in the existing central section of the city can be avoided; and the roads will enable more even distribution of population, etc. to avoid over-centralization.
- Key areas along the roads with traffic flow can be developed with distribution facilities and industrial parks; this will serve as an economic stimulus.

Since the total length of the ring roads will be approximately 100 km, it is not realistic to develop all sections at once. Accordingly, the question of priorities arises, based on the degree of the importance of the sections. This has not been discussed much. Examining the areas on the outskirts of Kabul, it appears that the area with the strongest connections with the inner city is the northern area. The volume of traffic to that area has been increasing year by year.

7.2.4 Development of missing link roads

There are many prospective locations for future development of the road network, including sections or roads with gaps or missing links. However, many of these locations are in mountainous areas where tunnels would be required or in areas where the topography has many troughs or river channels. Construction work in those areas would be difficult, and there would be a strong tendency for project costs to soar. Two zones where construction would be relatively easy are Zone 2 and Zone 16, both of which are in flatlands, and the roads would run in a north-south direction. It should be noted that both have sections with missing links midway on routes where a road has to cross the Kabul River. Bridge construction would be necessary in either of the two zones.

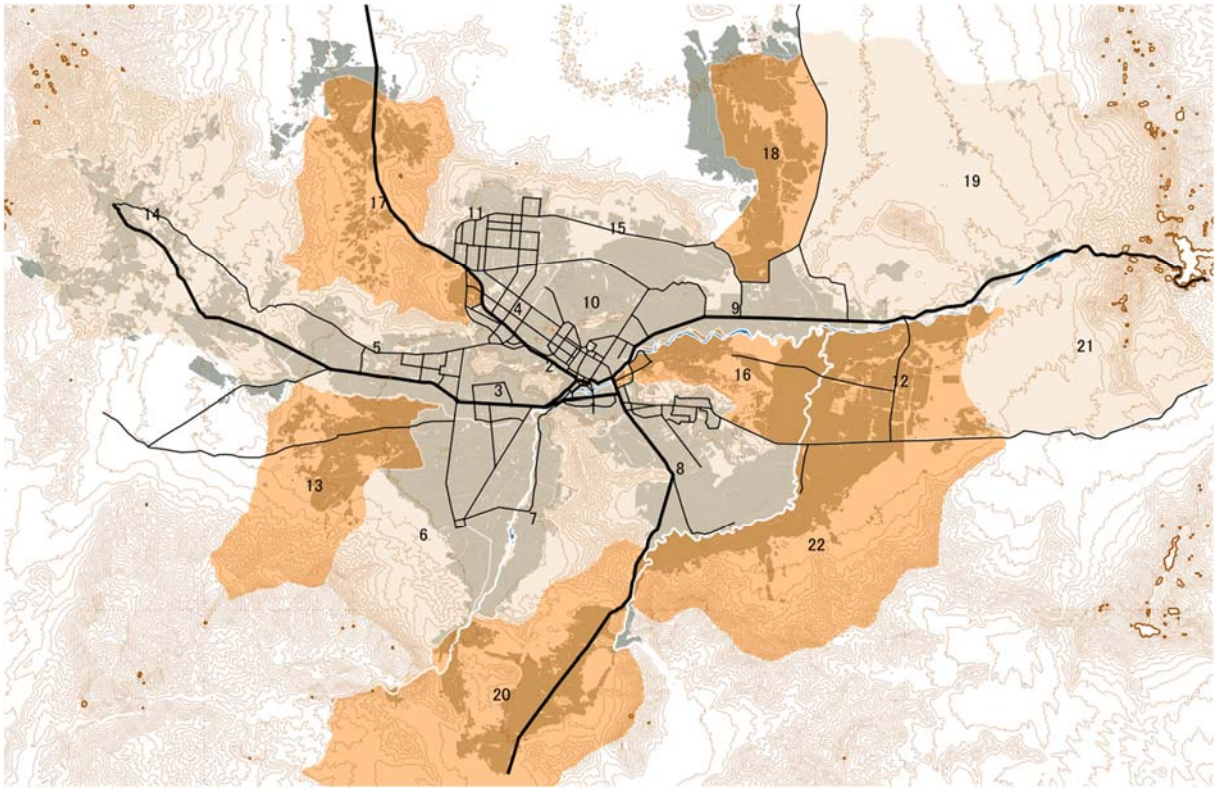


Source: Google Earth

Figure 7.2.4 Missing link roads in the eastern area of Kabul

7.2.5 Community road improvement

Several zones in Kabul City are targeted for road development or road repair work (see figures below). JICA has experiences of road repair works in Zones 4, 10 and 16 and elsewhere. Proposals have been made to carry out road maintenance and repair work in zones in these areas and in zones where such work has not been done. This includes the densely populated Zone 11, where arterial roads have been targeted for repair. The content of the work in this latter area includes paving unpaved sections, replacing pavement where the surface has deteriorated, widening narrow road sections, providing pedestrian crosswalks where needed, and completing roads where small gaps (missing links) exist.



Source: JICA Study Team

Figure 7.2.5 Targeted districts for community road development in Kabul

7.2.6 Development of traffic control centre

Establishing a traffic control office has been proposed as a short-term measure meeting immediate needs for signal equipment with advanced functions, for management of a bus location system, and for traffic monitoring and control. These will be small-scale facilities located in an office used exclusively for traffic control. It will also be desirable to proceed with a medium- and long-term project to establish a traffic control center of a fixed size in which digital ICT will be used in traffic control systems.

7.2.7 Technical cooperation to develop capacity for utilizing digital & ICT to improve urban transportation system

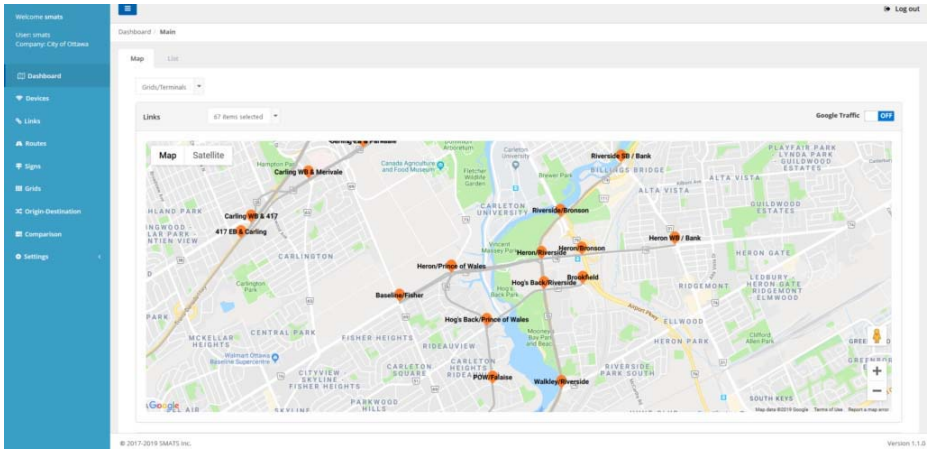
As a short-term measure, smart solutions that are relatively easy to install such as signal equipment with advanced functions and a bus location system have been proposed. At the same time, it is envisioned that Kabul City will reach the stage of making full use of digital ICT as part of medium- and long-term solutions.

Up until recently in the urban transportation field, sensors and CCTV have been installed on roadways to provide data enabling users to grasp traffic conditions. In recent years the use of IoT with digital ICT has become widespread. Specifically, this type of technology is used to collect big data relying on smart phones and devices in vehicles to provide information on vehicle locations, etc. In addition, AI is used for analysis, and advanced ICT is increasingly being uses in Intelligent Transportation Systems (ITS, or advanced highway traffic systems) providing integrated information on persons, roads and vehicles. For reference to help explain the technical cooperation proposed, examples of the use of digital ICT for improvement of urban traffic in other countries are presented below under the titles “Examples in urban traffic management” and “Examples of uses in public transportation management (bus).”

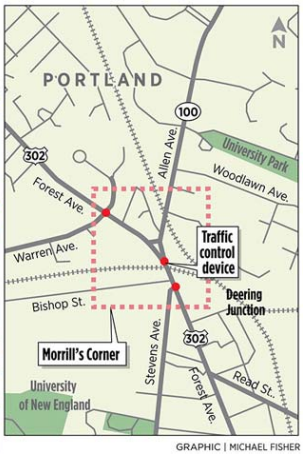
(1) Cases for urban traffic management

ICT is primarily used in urban traffic management primarily to monitor and grasp traffic conditions, and for control of traffic flows using traffic signals. Examples shown below illustrate the use of advanced IoT and AI systems to grasp conditions and control traffic in various cities to optimize overall traffic flows. Areas where traffic congestion has developed are targeted, and control measures can be selected. In addition, progress is being made to develop advanced solutions that are compatible with connected car technology and autonomous driving.

These types of traffic management solutions can be introduced, not only to mitigate congestion and eliminate traffic jams but also to render automobile use more effective. They can also be used along with traffic control for management of public transportation systems. Parallel efforts to convert drivers to users of public service by managing transportation demand have also become necessary in some areas.

City or region	Ottawa, Ontario Province, Canada
Solution	Floating car data used to obtain traffic information, and data analysis platforms were developed for real-time monitoring of traffic conditions. 

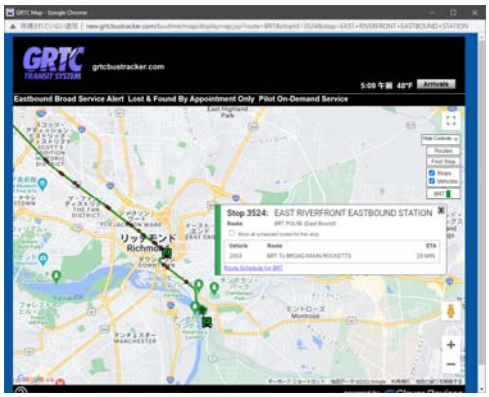
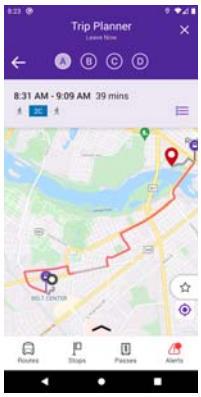
Usage method and effect	Focusing on areas with traffic congestion, results of city planning were verified, the impact of fluctuations in traffic patterns was determined, and the city's decision-making was enhanced, which enabled the city to adopt proposals as needed.
Source	https://www.smatstraffic.com/project/enabling-holistic-intelligent-city-transportation-management/
City or region	Miami (Dade County) Florida, U.S.A.
Solution	A smart signal system was adopted, which enables rapid timing adjustments to respond to changing traffic conditions and vehicle speeds. The system enables automatic adjustment of the time green lights are on in response to changing conditions, which results in smoother traffic flows. 
Effect	The smart signal system provides two-way communication for optimal timing. This supports effective communication that has helped the city achieve up to 33% reduction of travel times during peak hours.
Source	https://www.miamitodaynews.com/2020/08/04/7-year-smart-traffic-signals-upgrade-clock-ticking-in-miami-dade/

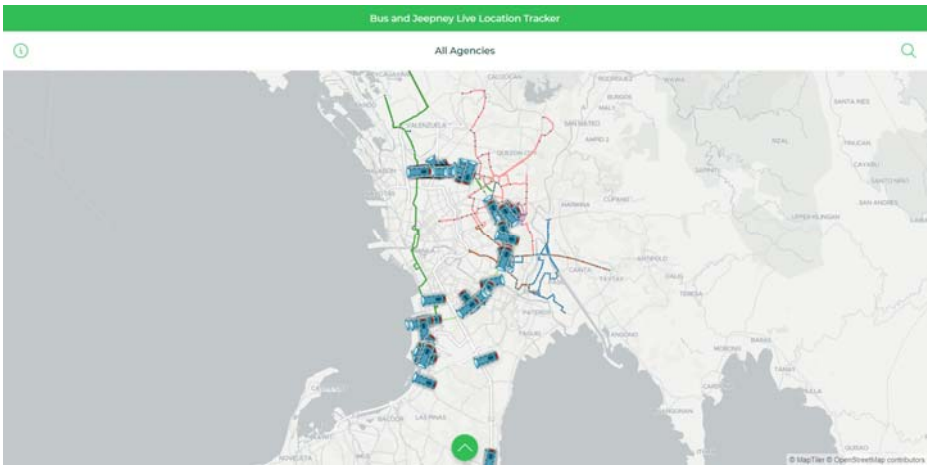
City or region	Portland, Oregon, U.S.A.
Solution	Images from cameras and roadside sensors are used to collect traffic information at intersections. AI is used in a signal control system that enables adjustments at each intersection. Real-time (second-by-second) adjustments of lights in coordination with those at intersections nearby have led to optimal traffic flows.  
Effect	It has been reported that the time required to move through targeted intersections has been reduced by 16%.
Source	https://www.rapidflowtech.com/blog/portland-reduces-delays-at-maines-busiest-traffic-intersection-after-surtrac-deployment#_ftn1

(2) Cases for public transportation management (bus)

Increasing numbers of bus operators in many countries have turned to the use of ICT technology to achieve more efficient, safer, and more convenient operations. This has led to expanded numbers of passengers using their services. Real-time monitoring provided by the bus management systems enables operators to grasp delays in arrival times and to avoid traffic jams. Monitoring also helps them provide passengers with information. Operating histories provided using a data management system supports guidance for improved driving safety. Introducing the system helps operators achieve punctuality and safe operation.

In addition to operating management, public transportation managers are increasingly using the technology to gather data to help them provide, as a service to passengers, real-time information about other public transportation services. This type of customer service includes information, not only on locations but also on projected arrival times and departure areas for service to intended destinations. In many cases, system operators are now providing users with guidance on route information, including notification of where transfers should be made.

City, region	Richmond, Virginia, U.S.A.
Solution	GPS is used to provide real-time bus location information and information on arrival times at each location. An exclusive application is used to provide information about routes, fares, where the nearest bus stop is located and guidance on transfers. Another service is an incentive program enabling passengers to buy all-day tickets for travel to any destination in the system.   
Effect	Providing passengers with information on delays, bus running times, and services enables them to reduce waiting times at stops. Mobile ticket use enables ticketless operation and discounts, which adds to customer convenience and results in increased ridership.
Source	http://ridegrtc.com/

City, region	Metro Manila in the Philippines
Solution	Using an application developed by a local start-up enterprise, information is provided on bus routes, and on rail, jeepney, ferry and other services. Customers learn about the best places to transfer, and real-time location information is provided. The system is also used to offer information on several routes, to enable passengers to compare travel times and prices. 
Effect	No report on effects has been issued at present time. Data will be accumulated in cooperation with the government, and inputs to help with policy decisions will be provided. Plans are also being developed to support companies' marketing efforts.
Source	https://sakay.ph/

7.3 Remarks on direction and support plans for medium term

The following are points to be aware of when carrying out the medium- and long-term measures discussed up until now:

- When discussing each of the programs, particularly when the cooperation supporting a project is in the form of a grant, it is necessary to be aware that highly accurate estimation will be required at an early stage.
- As in the case of short-term projects, menus of many different items will be studied in planning road infrastructure projects, support for public transportation, traffic control, and other work. Methods will have to be worked out to devise fair, objective and understandable evaluations of priorities. Long periods of time are needed for discussion and implementation, which means careful consideration must be given to the schedules needed for surveys and project implementation.
- Ring road development projects are large-scale. Many persons hold the opinion that only limited effects can be expected from them. For this reason, it is important that consideration be given to which road sections are a priority. Adjustments and cooperation with other donors should be discussed before moving ahead with these projects.
- The evolution of solutions involving the use of digital ICT is very rapid. It is very likely that conditions will greatly change. This should be kept in mind when considering the outlook for medium- and long-term programs. Diligent collection of information and a flexible approach are required.

Chapter 8 Proposal for technical cooperation on urban transport improvement in Kabul Metropolitan Area

8.1 Background and needs for technical cooperation

The population of Kabul, the capital of Afghanistan, in 2021 is estimated to be about 5 million, and the city faces serious urban problems, including traffic congestion. In 2002, Kabul Municipality experienced a rapid increase in population due to the return of refugees and the movement of people from other provinces to Kabul. The population continues to grow further and is expected to reach approximately 7 million by 2040. The number of private cars continues to explode in Kabul Municipality due to the rapid increase in population, the country's economic growth, and the lack of public transportation.

Construction of new roads to be added to the current road network in Kabul Municipality is difficult due to topographical constraints of this city. The current road network has reached its limit to handle the daily increase in traffic, and chronic traffic congestion is occurring in various parts of Kabul Municipality. Even traveling short distances takes a great deal of time, not only during the morning and evening peak hours, but also during the off-peak hours of the day. Since there is no railway transit system, all travelers in Kabul Municipality depend on road. At the same time, the capacity of public transportation such as buses, is insufficient, and is not operated according to people's needs. The major issues in the urban transportation of Kabul Municipality are shown below:

- Chronic traffic congestion in Kabul Municipality
- The uncontrolled stopping of taxi cabs, minibuses, buses, jaywalkers, and the street vendors occupying roads and intersections
- Lack of transportation infrastructure such as flyovers, underpasses, etc.
- Absence of reliable and safe mass transit
- Lack of appropriate traffic management and lack of awareness for traffic etiquette and rules

To alleviate the chronic traffic congestion, Kabul Municipality is examining reduction of automobile traffic through shifting to public transportation by providing alternative transportation systems such as the Bus Rapid System (BRT) or Bus with High Level Service (BHLS). Major trunk roads such as Darulaman Road and Massoud Road, for example, can introduce BRT and BHLS although the introduction of these systems is limited to the existing roads having wide road width. The Kabul Urban Development Framework (KUDF), the urban master plan concept of Kabul Municipality, also recommends the introduction of BRT. Kabul Municipality has also a history of hiring Khatib & Alami consultant to develop a BRT master plan. However, the KUDF and BRT MP have not examined any detailed plans for the most congested Central Business District (CBD). Therefore, it is important to control traffic efficiently at intersections and in the CBD areas. As a means of making BRT services more effective, it is important to sort out and organize the successful examples of the BRT past operations in other countries (especially the use of digital technology), with the expectation of ICT to become transportation management tools worldwide.

Keeping this in mind, Kabul Municipality has established the Transportation Planning Department and the Urban Public Transportation Department in 2020. In these departments, about 50 transportation engineers are engaged in the practice of developing transportation plans and developing public transportation system plans. This project will include development of the institutional development and human capacity development in these related departments, especially in the form of developing the transportation planning capacity, particularly developing the road network, developing public transportation plan, and developing

traffic management plan. As indicated above, JICA has set the following three directions of cooperation for improvement of the traffic environment in Kabul Municipality:

- By eliminating the bottlenecks in Kabul Municipality, the smooth traffic should be ensured in Kabul Municipality.
- Promotion of modal shift to public transportation
- Development of the optimal road network in the Kabul Municipality urban area

This project promotes solutions as described in items 1 and 2 above and is expected to be an important stepping-stone for improving the transportation environment in Kabul Municipality. The proposed technical cooperation will work to strengthen the capacity of the professionals in the area of sustainable urban transportation. This project is also expected to contribute to the development of experts in the above-described fields and further the discovery of potential human resources by linking this project with the existing PEACE Scholarship Program.

8.2 Project summary

8.2.1 Overall goal

Traffic management will be implemented to alleviate traffic congestion in Kabul Municipality. Comfortable, effective and efficient public transportation services will be provided.

8.2.2 Project purpose

The implementation capacity of Kabul Municipality to manage the implementation of projects related to urban transportation will be strengthened.

8.2.3 Outcome

- (1-1) Traffic survey and analysis using the smart digital technology will be implemented.
- (1-2) The Kabul Municipality Urban Transport Master Plan will be updated.
- (2-1) A pilot project related to an effective traffic management will be planned and initiated through analysis and simulation aiming at elimination of traffic bottlenecks.
- (2-2) For introduction of an effective public transportation system, a public offering was made for BRT/BHLS pilot route operation and management projects, which will begin operation.
- (3-1) A roadmap/action plan for the realization of the Kabul Municipality Urban Transportation Master Plan will be developed, and implementation policies for transportation demand management will be proposed.

8.2.4 Activities

(1-1) Traffic survey and analysis using the smart digital technology will be implemented:

a. Review of existing traffic survey results
b. Design and preparation of surveys using digital technologies
c. Analysis of survey results
d. Error checking and data compilation
e. Review and update of present OD tables

(1-2) The Kabul Municipality Urban Transport Master Plan will be updated:

a. Analysis of current road network and public transport problems/challenges
b. Formulation of socio-economic frame and land use plan/urban sub-center development
c. Traffic demand forecast modeling using JICA STRADA
d. Review and updating future road and public transport network
e. Implementation plan of future transport projects
f. Evaluation of future transport projects
g. Recommendation on use of digital smart technologies and data platform on urban transport sector

(2-1) A pilot project related to an effective traffic management will be planned and initiated through analysis and simulation aiming at elimination of traffic bottlenecks:

a. Identification of traffic "hotspots/bottlenecks" that may affect the smooth traffic including public transport
b. Conducting survey on the possibility of rerouting traffic flow at the CBD area
c. Conducting road safety audits for priority roads and implementing countermeasures necessary to improve the safety of the roads
d. Conducting simulations to solve the hotspots/bottlenecks applying some countermeasures (e.g. equipment installation for traffic monitoring and data collection, parking control, ITS such as public transport priority system, advanced traffic light, traffic control center, etc.)
e. Selection of pilot project(s) for traffic management
f. Design of pilot project(s)
g. Formulation of implementation plan of pilot project(s)
h. Implementation and evaluation of pilot project(s)

(2-2) For introduction of an effective public transportation system, a public offering was made for BRT/BHLS pilot route operation and management projects, which will begin operation:

a. Design of pilot line of BRT based on government policy and result of traffic survey
b. Preparation of bidding documents for implementation of the pilot line of BRT and related necessary facilities like depots, bus stops, transport terminals
c. Development of criteria for selecting operating company and performance review
d. Formulation of operation and maintenance plan for buses and public transportation infrastructure
e. Daily monitoring of ridership, fare collection, operational status
f. Identification of issues and implement quick solutions
g. Conduct passenger satisfaction survey
h. Evaluation and drawing lessons from pilot BRT line for sustainable operation of BRT
i. Advise for sustainable planning and operation of other BRT lines using the experience of the pilot route

(3-1) A roadmap/action plan for the realization of the Kabul Municipality Urban Transportation Master Plan will be developed and implementation policies for transportation demand management will be proposed:

a. Institutional assessment of urban transport related institutions
b. Recommendation for future traffic management
c. Recommendation of development policy along the BRT corridor and terminals

The following are common activity items:

a. Preparation of result based action plan for capacity development and selection of candidates for training of trainers
b. Monthly monitoring meeting and semi-annual joint coordination committee
c. Study tours to Japan and third countries to lean actual BRT operation, ITS and traffic management
d. Support for preparation of thesis and presentations for national and international conferences

8.3 Implementation framework

More than 50 urban transportation engineers are working currently in the three departments listed below of the Kabul Municipal Government. Nine engineers have been dispatched to Japan as the PEACE project students for studying the urban transportation planning from the Kabul Municipal Government so far. Synergistic effects between this project and the PEACE project are also expected.

1) Directorate of Infrastructure Planning
2) Directorate of Public Transport
3) Directorate of Traffic Coordination and Management

8.4 Proposals for strengthening relation between JICA and JICA trainees or among JICA trainees

JICA has been supporting programs to foster the core human resources in Afghan ministries, who take the leadership in the development of Afghanistan in collaboration with Japanese universities. This JICA program is called the Bridge for the Future and Core Human Resources Development Project (commonly known as the PEACE Project). Looking back at the relationship between JICA and trainees after their return to Afghanistan, it can be seen that the trainees have cooperated with JICA as counterparts (C/P) in charge of projects (providing information and collaboration) and as the temporary support members for Japanese expert teams as needed. On the other hand, we have heard about many problems in the Afghan ministries and Kabul Municipality, where these staff members are being replaced rapidly, and it is difficult to retain them. One of the possible ways of creating the continued collaboration is creating an opportunity in which the trainees who have returned to Afghanistan can be employed by Afghanistan's educational institutions (universities, etc.).

In Afghanistan, a presidential decree has been issued to make a full use of the knowledge of trainees who have received education and training in the foreign educational institutions, as much as possible in the developmental aid projects provided by international donors. Personnel who are studying at universities are often future key staff members and executive candidates for Afghanistan national and local governments. When trainees who studied in Japan use their knowledge to educate future candidates for excellent staff after they have returned to Afghanistan, it can be said that our educational support for Afghanistan trainees is supporting the foundation of Afghanistan's future nation building.

When the trainees are assigned to each specialized program at the universities after they have returned from Japan, just in the same manner as they are scattered among national and local governments as officials, the university students can acquire the knowledge and skills required in the actual fields (ministries and local governments), in the university curriculum. It is considered very efficient and effective in terms of consistently developing the country's core human resources.

8.5 Points to be considered for implementing technical cooperation

8.5.1 Lessons learnt utilizing from the similar projects in the past

There is always a risk that the results of technology transfer will be limited due to change of the Kabul Municipality Government staff members. For this reason, the "Kabul Municipality Road Construction Management Project" (2016-2021) has provided a direct training of trainers (Training of Trainers) by training in Japan and in third countries in order to maximize the results of the training work under conditions where the overseas travel of experts is restricted. The Training of Trainers program has achieved success by adopting a remote support method using horizontal deployment (Peer Training) by instructors who received direct instruction and On-the-job Training by the implementing the local on-site institution. The same approach will be adopted in this project as we envision implementation of the training system which will not be affected by the transfer of Kabul Municipality Government staff members, in the mid- to long-term, by securing the young human resources and raising the level of human resources related to urban transportation.

8.5.2 Prospects for collaboration with the third countries

Collaboration with regions that are implementing similar projects, mainly in Asia, the Middle East, and Latin America, for updating urban transportation master plans (including traffic surveys) and for effective traffic management and introduction of urban public transportation such as BRT can be envisaged.

8.5.3 Cooperation with other donors

As the main donor support for urban development or urban transportation in Kabul Municipal Government, the World Bank is supporting the Kabul Municipal Development Program (KMDP) (2012-2021) (Grant 110 million USD) to improve administrative services, financial management systems, and emergency response capacity in Kabul Municipal Government. The World Bank has also supported the Kabul Urban Transport Efficiency Improvement Project (KUTEI) with a 90.5 million USD grant (2014-2020) to rehabilitate arterial roads and improve the associated construction supervision capacity and project management capacity by the PMU.

8.5.4 Synergistic effect with previous Japanese support

JICA has been providing technical assistance for the formulation and updating of the urban development master plan in Kabul Municipality and the introduction of urban development methods to realize the plan. JICA has also provided technical assistance for the construction of roads and bridges and their maintenance to eliminate traffic bottlenecks in Kabul Municipality. In the area of urban transportation, in 2003, JICA provided 115 buses and 252 bus stops to strengthen the public transportation system in the city of Kabul Municipality. Currently, as an introduction to this project, we are organizing the necessary information to be able to provide technical assistance for medium- to long-term improvement of urban transportation in Kabul Municipality, and providing basic technical assistance to the Kabul Municipal Government through workshops and other activities related to urban transportation planning.

(1) Formulation and Update of the Urban Development Master Plan, and Formulation and Update of the Urban Planning and Development Management Methodology

- "Kabul Municipality Area Development Plan Survey (KMAD)" (2007-2009) (Independent Municipality Area Development Authority)
- "Kabul Municipality Area Development Promotion Project (GKD)" (2010-2015) (Independent Municipality Area Development Organization)

- Sub-projects: Kabul Municipality Urban Development MP Updates (2011). Urban Development Human Resource Development (UDH1 & UDH2) (2011-2015)
- "Kabul Municipal Government Functional Improvement Project in Land Rezoning and Urban Redevelopment" (2016-2020)
- "Information Collection and Confirmation Study on Urban Development" (2020-2021) (Ministry of Urban Development and Land)

(2) Road and Bridge Infrastructure Development

- "Road Maintenance Management System Development and Human Resource Development Project" (2008-2012) (Ministry of Public Works)
- "Existing Kabul Municipality Road Improvement Subproject" (2010-2015)
- "Kabul Municipality East-West Arterial Road and Others Improvement and Rehabilitation Plan" (2012-2015)
- “Study for Information Collection and Verification on Roads and Bridges in Kabul Municipality" (2012-2013)
- "Kabul Municipality Road Construction Management Capacity Strengthening Project" (2016-2020)
- "Kabul Municipality Southeast Access Improvement Plan" (2019-2021)
- "Preparatory Study for the Project of Main Road Bridge Development in Kabul Municipality" (2021)

(3) Urban Transportation

- "Kabul Municipal Public Transport Capacity Restoration Plan" (2003) (Ministry of Transport)
- "Study for Information Collection and Verification on Urban Transportation" (2021)

Chapter 9 Training in third countries/training in Japan (draft plan)

9.1 Status of implementation of trainings

Due to the drastic political change in Afghanistan in August 2021, the third country trainings which were planned for this study could no longer be possible. Prior to that, two training sessions were scheduled in Delhi, India, and one in Jakarta, Indonesia; however during the study period, the global pandemic of the COVID-19 made it difficult to travel abroad. For this reason, several other alternative third-country locations where travel would be relatively easy even with the spread of the COVID-19 were considered. However, after the fall of Kabul, 15 August 2021, it is impossible to conduct both third-country training and the training in Japan.

The following section is a record of the discussion on the matter at that time as well as a preparation in the event that economic cooperation will be resumed in the future, along with international recognition of de facto authorities.

9.2 Training in third countries (draft plan)

The candidate cities for the third-country training were Delhi, India (twice) and Jakarta, Indonesia (once). It is expected to raise capacity and knowledges on urban transport through activities such as observation and interviews on introduction of the urban transportation system and the technologies to be implemented in Jakarta, and to open a consultation in Delhi at the time coinciding with the submission of report, which is output of this study. Table 9.2.1 shows initial draft plan including the schedule, location, and proposed training contents of the third-country training course.

Table 9.2.1 Implementation policy for the third-country training

Number of meeting	Date	Location	Discussion concerning this work	Verification of urban transportation technologies and effort examples (only in Jakarta)
1st	February 2021	Delhi	IC/R consultation	・ Organizational system of the related organizations (public and private) ・ National development plan and sectoral development plan ・ Legal system and business scheme for urban transportation ・ Applicable urban transit facilities (BRT, etc.) for Kabul with their potential usage ・ Projects in progress and projects in the planning stage, and Visits
2nd	May 2021	Jakarta	IT/R consultation	
3rd	August 2021	Delhi	Discussion on short- and medium-term support policy	

Source: JICA Study Team

Table 9.2.2 Proposed schedule for third-country training preparation

	Location		Schedule	Contents of implementation
1st meeting	Delhi	1st	Feb 21 (Sun)	IC/R consultation
		2nd	Feb 22 (Mon)	Discussion on basic information of the urban transportation sector in the Kabul Metropolitan Area
		3rd	Feb 23 (Tue)	Organize documents
		4th	Feb 24 (Wed)	Latest status of the urban transportation sector of the Kabul Metropolitan Area
		5th	Feb 25 (Thu)	Request for necessary information, and discussion for future plans
2nd meeting	Jakarta	1st	May 16 (Sun)	IT/R consultation
		2nd	May 17 (Mon)	IT/R consultation
		3rd	May 18 (Tue)	Jakarta Metropolitan Area transport policy consultation (MOT, DKI Jakarta)
		4th	May 19 (Wed)	Jakarta city mass transit inspection and consultation (Transjakarta, MRT, LRT)

		5th	May 20 (Thu)	Jakarta city highway inspection (Jasa Marga)
		6th	May 21 (Fri)	Jakarta city general road inspection (DKI Jakarta)
		7th	May 22 (Sat)	Organize documents
		8th	May 23 (Sun)	Jakarta city railroad inspection (MRT, LRT)
3rd meeting	Delhi	1st	Aug 22 (Sun)	Presentation of the latest information on the urban transportation sector and the results of demand forecasts
		2nd	Aug 23 (Mon)	Investigation on the future vision and analysis of issues
		3rd	Aug 24 (Tue)	Organize documents
		4th	Aug 25 (Wed)	Investigation on short- and medium-term support measures
		5th	Aug 26 (Thu)	Proposed table of contents for DF/R, and discussion on future plans

Source: JICA Study Team

9.3 Training in Japan

The project had a plan to realize the training in Japan in December 2021, on the premise of conducting a study tour of Japanese technologies and urban transport products that may be applicable to Kabul Municipality, and with the assumption that DF/R consultations will be conducted. For the study tour, four cities shown in Table 9.2.3 were planned to learn advanced or effective public transportation system. As the Kabul Municipality was focusing on transportation planning at that time, we thought that a site survey of BRT would be the best, and assumed "Nagoya City" as the first candidate. Study tours in Tokyo are efficient because the DF/R consultations can be conducted at the same location. Table 9.2.4 shows the proposed study tour schedule and other schedules at that time.

Table 9.3.1 Transportation strategies by city (listed as the candidate cities for training)

Target cities	Characteristics of urban transportation systems
Nagoya city	Trunk line buses and guideway buses, IMTS
Hiroshima city	The largest tram network in Japan
Kitakyushu city	The largest bus network in Japan
Tokyo Metropolitan Area	The Largest metro network in Japan

Source: JICA Study Team

Table 9.3.2 Proposed schedule and activities for study tour to Japan

	Schedule	Contents of implementation	Stay
1	Dec 1 (Wed)	Orientation, DF/R consultation	Tokyo
2	Dec 2 (Thu)	DF/R consultation	Tokyo
3	Dec 3 (Fri)	Inspection tour of metropolitan transportation system (1) (including explanation and discussion)	Tokyo
4	Dec 4 (Sat)	Travel to Nagoya	Nagoya
5	Dec 5 (Sun)	Organize documents	Nagoya
6	Dec 6 (Mon)	Inspection tour of Nagoya City transportation system (1) (including explanation and discussion)	Nagoya
7	Dec 7 (Tue)	Inspection tour of Nagoya City transportation system (2) (including explanation and discussion)	Nagoya
8	Dec 8 (Wed)	Travel to Tokyo, and inspection tour of Shin-Yokohama area	Tokyo
9	Dec 9 (Thu)	Inspection tour of Tokyo transportation system (2) (including explanation and discussion)	Tokyo
10	Dec 10 (Fri)	Wrap-up meeting	

Source: JICA Study Team

Since overseas travel was restricted due to the COVID-19 pandemic around the world, several countries and cities were considered as an alternatives for training destinations, comparing original training locations (i.e. Delhi, India and Jakarta, Indonesia) including Turkey, Azerbaijan, and the UAE. In addition, considering cultural, and religious similarity, Hanoi, Bangkok, and other cities were nominated as candidates for training

as locations where JICA has been involved in master planning and implementation of many urban transport projects. Eventually, Istanbul, Turkey, and Dubai, UAE, were selected as the best given the restrictions, but no actual training was conducted.

Table 9.3.3 Alternative cities for third-country training (training in Japan)

City / Country	Jakarta/ Indonesia (Original)	Delhi/ India (Original)	Tokyo, Nagoya, Hiroshima or Kita-kyushu/ Japan (Original)	Baku/ Azerbaijan	Istanbul/ Turkey	Dubai/ UAE	Hanoi/ Vietnam	Bangkok/ Thailand
Consistency in study tour	World's longest BRT developed in very short period.	Public transportation is not developed well.	Nagoya has BRT, guideway bus system and IMTS (Intelligent Multimode Transit System). Hiroshima has the largest LRT/tram network in Japan. Kita-kyushu has one of the largest bus network in Japan. Tokyo has the largest metro network in Japan.	Baku BRT system is one successful case with very good operational and management system.	Istanbul has a well developed Intelligent Transport System (ITS).	Well developed public transportation	BRT supported by World Bank is not operated well. Its dedicated lanes are occupied by private vehicles.	Several types of public transportations including BRT are available
Flight availability	From Tokyo: used to operate daily direct flights, but no commercial flight now. From Kabul: used to operate connection flight via Dubai, India, etc., but no flight now.	From Tokyo: used to operate daily direct flights, but only connection flights now. From Kabul: daily direct flight	From Kabul: connection flight via Istanbul	From Tokyo: connection flight via Istanbul, Doha or Dubai. From Kabul: connection flight via Dubai or Istanbul	From Tokyo: daily direct flight From Kabul: daily direct flight	From Tokyo: daily direct flight From Kabul: daily direct flight	From Tokyo: used to operate daily direct flights, but only limited connection flights now. From Kabul: no flight now	From Tokyo: daily direct flight From Kabul: connection flight via Delhi
VISA for Afghan	Available via JICA	Easily available	Available via JICA	Available via JICA In normal condition, for governmental officials visa can be issued on arrival. As for national staff, it looks a bit difficult. Visa should be issued from India, Dubai or Pakistan. Travel agencies may handle this issue on behalf of the applicant.	Easily available An invitation letter from JICA Istanbul office may speed up the process. Even there is no official letter from JICA, it is still possible to get it.	Easily available	Available via JICA For governmental officials visa can be issued on arrival. For non officials (project staff), travel agencies will get it.	Available via JICA Travel agencies handle visa issuance.
JICA Office	Available	Available	-	operated from JICA Uzbekistan Office	Available	None	Available	Available
COVID-19 situation (as of 20 July)	Very seriously infected	Used to be very serious in Apr-May 2021, but getting better.	Highly infected	Used to be highly infected, but less now	Used to be seriously infected, but less now	Used to be highly infected, but less now. Well vaccinated	Generally less infected, but increasing now	Used to be less infected, but seriously infected now
Immigration rule under COVID-19 pandemic (as of 20 July)	- Generally not allowed - Suspension of VISA issuance	- Negative certificate - Self-quarantine or self-monitoring for 14 days	- Not allowed from infected countries including Afghanistan	- Generally not allowed - Suspension of VISA issuance	- Negative certificate or Vaccination - No quarantine	- Negative certificate - No quarantine - PCR test on arrival for Afghan - Depending on the covid-19 infections, visa issuance is temporarily suspended.	- Generally not allowed - Suspension of VISA issuance	- Negative certificate - Mandatory quarantine for 14 days - Travel insurance coverage of up to USD 100,000
Evaluation	**Impossible now**	**Not recommended (High risk of COVID-19)**	**Impossible now**	**Impossible now**	**Best option**	**2nd best option**	**Impossible now**	**3rd option**

Note: In case of connection flights, some additional requirements (e.g. negative certificate) may be applied for transit due to COVID-19 pandemic.

ANNEX

SUMMARY OF TRAFFIC SURVEY RESULTS

Contents

1. Introduction

The Japan International Cooperation Agency (JICA) in collaboration with Kabul Municipality and Ministry of Transport, is currently planning to carry out the Data Collection Survey for Urban Transport in Afghanistan. Traffic information in Kabul is required to grasp current situation, specifically to update present zone OD matrix, and to formulate the countermeasure for effective traffic management. Yachyio Engineering Co. Ltd., the JICA consultant, entrusted the Afghan Transportation Engineering Center of the Engineering Partnership Research and Service Organization to perform basic traffic data collection.

2. Scope of Work

The purpose of the survey was to perform traffic counts, passenger counts, and Origin-Destination (OD) survey in nine locations in Kabul city. The survey was divided into two parts: the screen line survey and the cordon line survey. For the screen line survey three locations and for the cordon line survey six locations have been selected based on the previous study performed back in 2008 by the JICA Study Team to develop Kabul City Master Plan. The locations for the screen line and cordon line are shown in Figure 1.

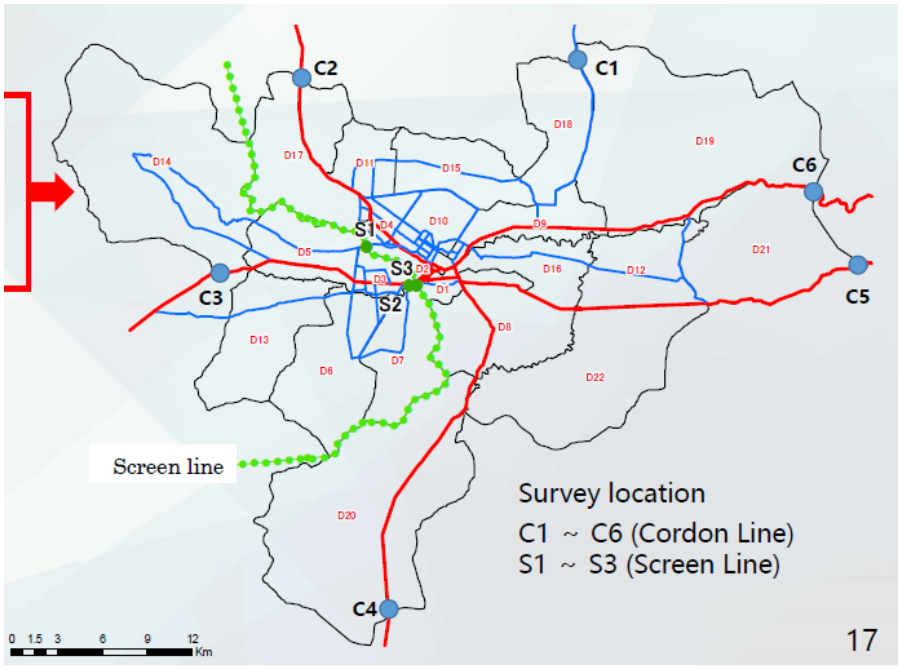


Figure 1: Locations of the DATA Collection for Screen Line (S1-S3) and Cordon Line (C1-C6) (Source: JICA Study Team, PPt, 2021)

3. Organization of the Project Team

Based on the scope of work and in line with the study objectives, a project team was assigned to implement the data collection project. There were 36 people working in the project team. Twenty Civil Engineering (CE) graduates in two to three work shifts performed the OD survey and passenger counts in the field. And, four instructors were involved in site supervision. A company was hired to deploy the cameras at the count stations. Furthermore, 5 CE senior students as interns were involved in data extraction in the office. The project admin/finance was responsible to coordinate with the relevant organizations in order to obtain permission for installation of the cameras and site survey. The team leader was responsible to coordinate among the sub teams and monitor the quality of the data collection service. In addition, the team leader was responsible to monitor the overall project progress to ensure a timely completion of the project. The project team organization is shown in Figure 2.

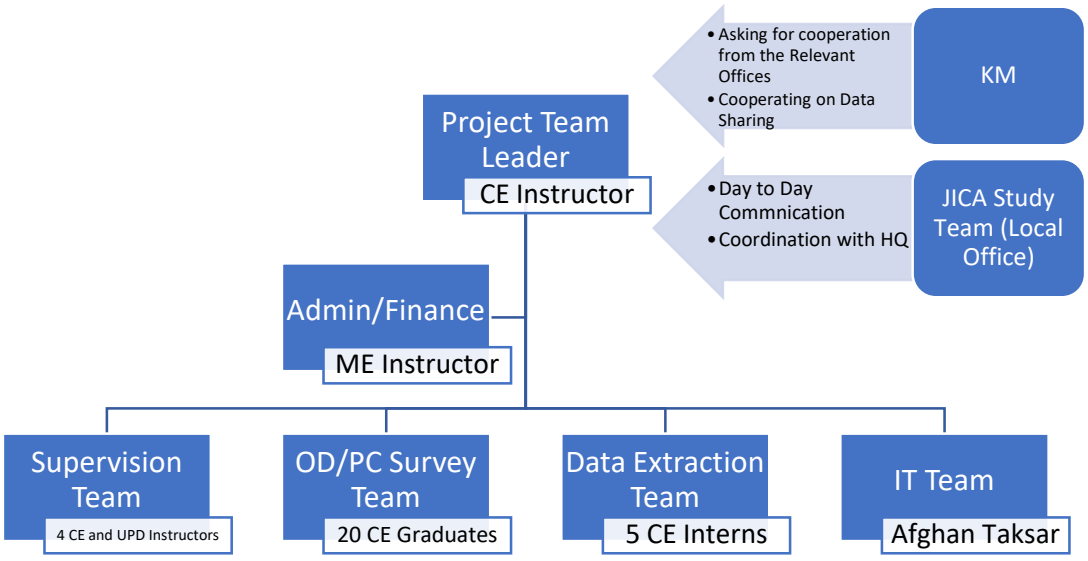


Figure 2: Project Team Organization

4. Implementation Schedule

According to the project Terms of Reference (ToR), following are the main deliverables:

- Implementation Schedule
- Draft Final Report
- Final Report
- All collected soft copy data and documents during the survey

A detailed work schedule was developed to meet the timelines based on the project requirements. The project schedule can be found in Appendix A.

5. Screen Line Survey

Survey Location

Screen Line survey was conducted at three locations in Kabul city as shown in Figure 3. S1 is located at Baghe Bala street, S2 is located at She Aqrab street and S3 is located at Gozargah Street.

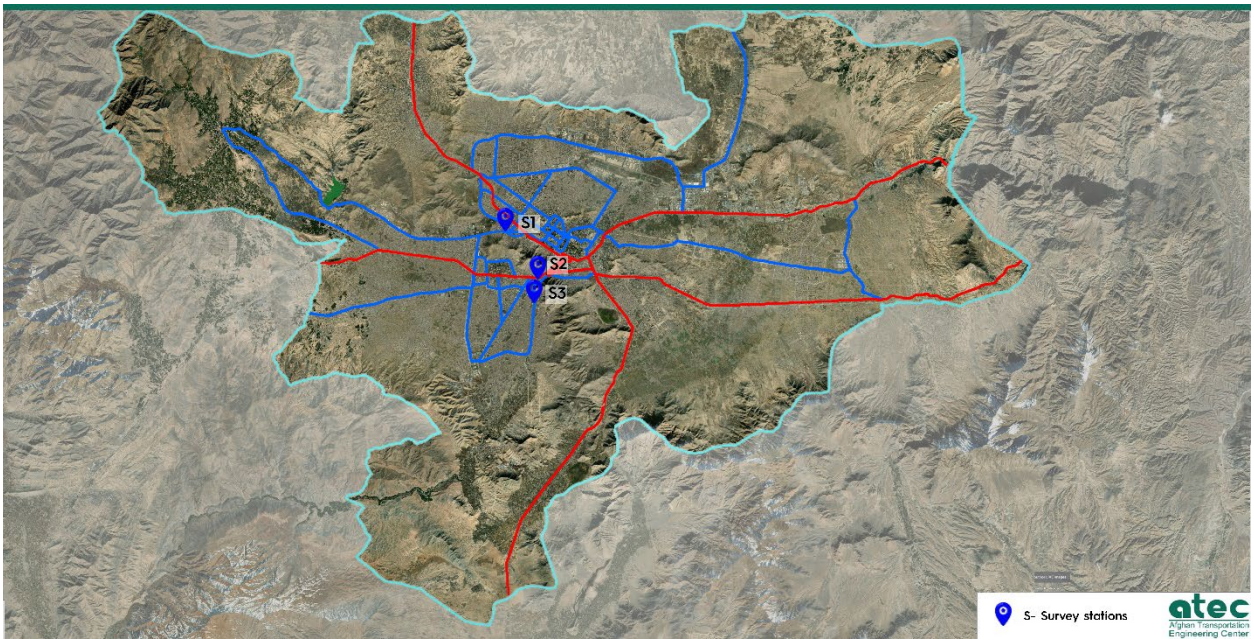


Figure 3: Survey Stations at the Screen Line

Survey Duration

The cameras were deployed to record the traffic flow at the survey stations. The duration of the video records were 24 hours except for S2 which was 22 hours. Then the traffic count was conducted for 16 hours at two locations (S1 and S2) and for 24 hours at one location (S3). Furthermore, the traffic passenger count was conducted at all of the stations for 16 hours in the field. Summary of the survey is shown in Table 1.

Table 1: Summary of the Screen Line Survey

Survey Station		Coverage (hours)		
Code Number	**Road Name**	**Video Records**	**Traffic Count**	**Passenger Count**
S-1	Baghe Bala	24	16	16
S-2	Seh Aqrab	22	16	16
S-3	Gozargah	24	24	16

Vehicle Classification

For the traffic count purpose the vehicles were counted in the following 8 types:

- Bike/Bicycle
- Micro Bus
- Mini Bus
- Large Bus
- Taxi
- Passenger Car
- Truck
- Other (Rickshaw, 3-wheelers motorcycles, Horse cart, Wheel chair, …)

However, the difference between Microbus and Minibus due to the existence of a wider range of vehicles operating in the city was somehow confusing. For the traffic count purpose the so called Tunes and Astana were considered as Microbuses which have 11 and 14 seats, respectively. The minibus was considered to have more than 20 seats and the large buses have more than 40 seats. This helped us to convert the crowed level to the number of passengers in order to estimate the vehicle occupancy rate.

Survey Forms

Considering the study objectives, the survey forms were developed as follows, and can be found in Appendix B.

- Form-1, for traffic count in 15-minute intervals
- Form-2, for passenger count/level of crowd

Survey Methodology

To conduct the traffic survey, it was necessary to get the permission from the relevant organizations. At the start of the project, permissions were obtained from the Kabul Municipality, Kabul Security Police office, and the Kabul Traffic Department.

In the second stage, the cameras were deployed at the count stations. Mainly two cameras (one for each direction) were installed at the stations. The cameras were mounted between 4 to 8 meters on the existing poles or bridges. Figure 4 shows the crews during the camera installation at Baghe Bala street (S-1). Basically, the camera views captured the rear end of the vehicles, however, in some locations front end were recorded. In either case, the records were suitable for the purpose of traffic counts and vehicle classification.

Figure 4: Camera Installation at Baghe Bala Street (S-1)

The cameras were ready for operation/recording just before 6am and continued to cover the target duration with no break. Figure 5 shows the cameras in operation which were installed on a street light pole at Gozargah street (S-3).

Figure 5: Cameras in Operation at Kabul-Bagram Road (C-1)

The "VEHICLE COUNT" application was utilized for manual counting from the video records. It was expected that using the application save time and enhance the accuracy of the traffic counts. To ensure the accuracy, at least four 15-minute random intervals for each station were recounted. The difference in the counts were noted as 0 to 5 percent. It can be concluded that utilizing the application for the vehicle counts from the video records was a convenient tool for the data extraction.

In addition, the survey crews conducted passenger count survey close to the locations of the cameras, in order to count the passengers inside the vehicles.

Staffing

Considering the survey duration, the data collection was performed in 2 to 3 work shifts. Each shift is defined as 8 hours. For the passenger count, in each shift, there was a survey crew comprising of six people. Four persons were counting passengers (two in each direction), one served as reserve, and one was the supervisor. In addition, two traffic police were helping the crew when needed.

Survey Performance

It was planned to collect the traffic data on weekdays (Saturday to Thursday). Despite of many challenges such as lack of power sources at the stations, the cameras were deployed successfully at all of the count stations. Moreover, passenger counts were successfully performed in two shifts at each station. A summary of the implemented survey is shown in Table 2.

Table 2: Summary of the Implemented Survey at the Screen Line

	Survey Station		Coverage (hours)		
Date of the Survey	**Code Number**	**Road Name**	**Video Records**	**Traffic Count**	**Passenger Count**
03 and 06 July, 2021 (Sat. and Tue.)	S-1	Baghe Bala	24	16	16
04 July, 2021 (Sun.)	S-2	Seh Aqrab	22	16	16
05 July, 2021 (Mon.)	S-3	Gozargah	24	24	16

Summary of Survey Results

The total number of traffic coming to the city (inbound) and going out of the city (outbound) crossing the screen line is summarized in Table 3. The heaviest traffic was observed at Baghe Bala (S-1), followed by Seh Aqrab (S-2) and Gozargah (S-3) streets, respectively.

Table 3: Summary of the Traffic Volume at the Screen Line

Survey Station		Traffic Volume			
Code Number	**Road Name**	**Inbound**	**Outbound**	**Total**	**Duration (hour)**
S-1	Baghe Bala	54,970	43,301	98,271	16
S-2	Seh Aqrab	45,102	50,182	95,284	16
S-3	Gozargah	24,486	22,280	46,766	24

In order to convert the 16h to 24h traffic count, the conversion factors derived from the 24 hours count at S3, i.e. 1.05 for inbound and outbound traffic, was used. As a result, the total 24h count can be estimated as 249,999 on the screen line.

The total traffic volume coming into and going out of the city, crossing the screen line, by vehicle type is shown in Table 4.

Table 4: Traffic Volumes by Vehicle Type on Screen Line

(Unit: Vehicle/16h)

Point	Direction	Bike	Micro-Bus	Mini-Bus	Large-Bus	Taxi	Car/4WD	Truck	Other	Total
S1	Inbound	3,574	2,276	188	17	4,420	40,716	2,904	875	54,970
	Outbound	3,166	2,039	236	22	3,636	30,439	2,576	1,187	43,301
S2	Inbound	8,175	4,735	639	23	3,622	24,914	2,025	969	45,102
	Outbound	9,819	4,775	620	33	3,985	27,755	2,233	962	50,182
S3	Inbound	10,121	3,437	100	-	967	7,581	580	460	23,246
	Outbound	7,075	2,914	70	1	1,180	8,832	541	616	21,229
Total	Inbound	21,870	10,448	927	40	9,009	73,211	5,509	2,304	123,318
	Outbound	20,060	9,728	926	56	8,801	67,026	5,350	2,765	114,712
	Inbound+ Outbound	41,930	20,176	1,853	96	17,810	140,237	10,859	5,069	238,030
	Share	17.6%	8.5%	0.8%	0.0%	7.5%	58.9%	4.6%	2.1%	100.0%

The composition of vehicle type, crossing the screen line, is shown in Figure 6.

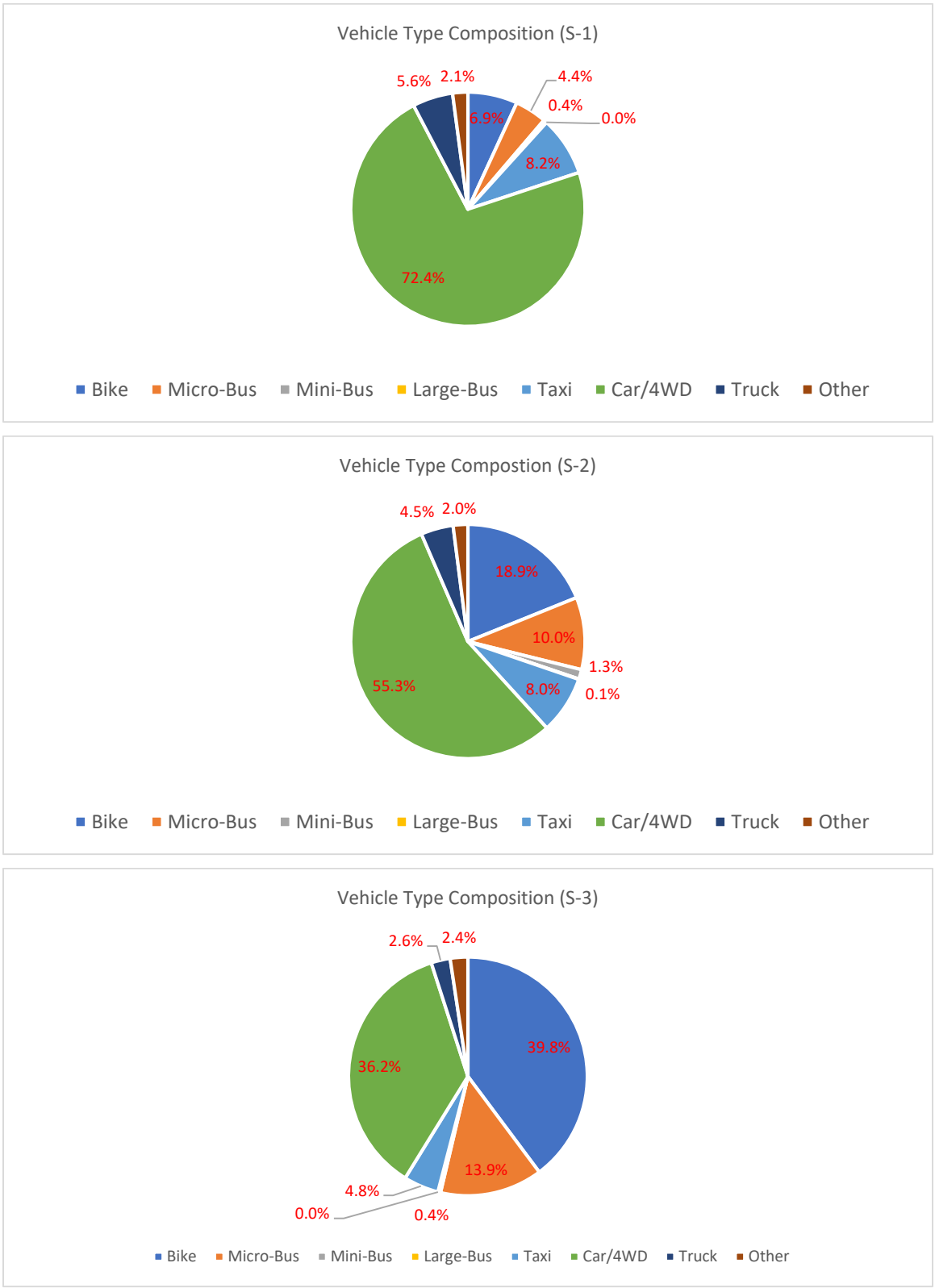


Figure 6: Composition of Vehicle Type at the Screen Line

The variation of hourly traffic volumes is shown in Figure 7.

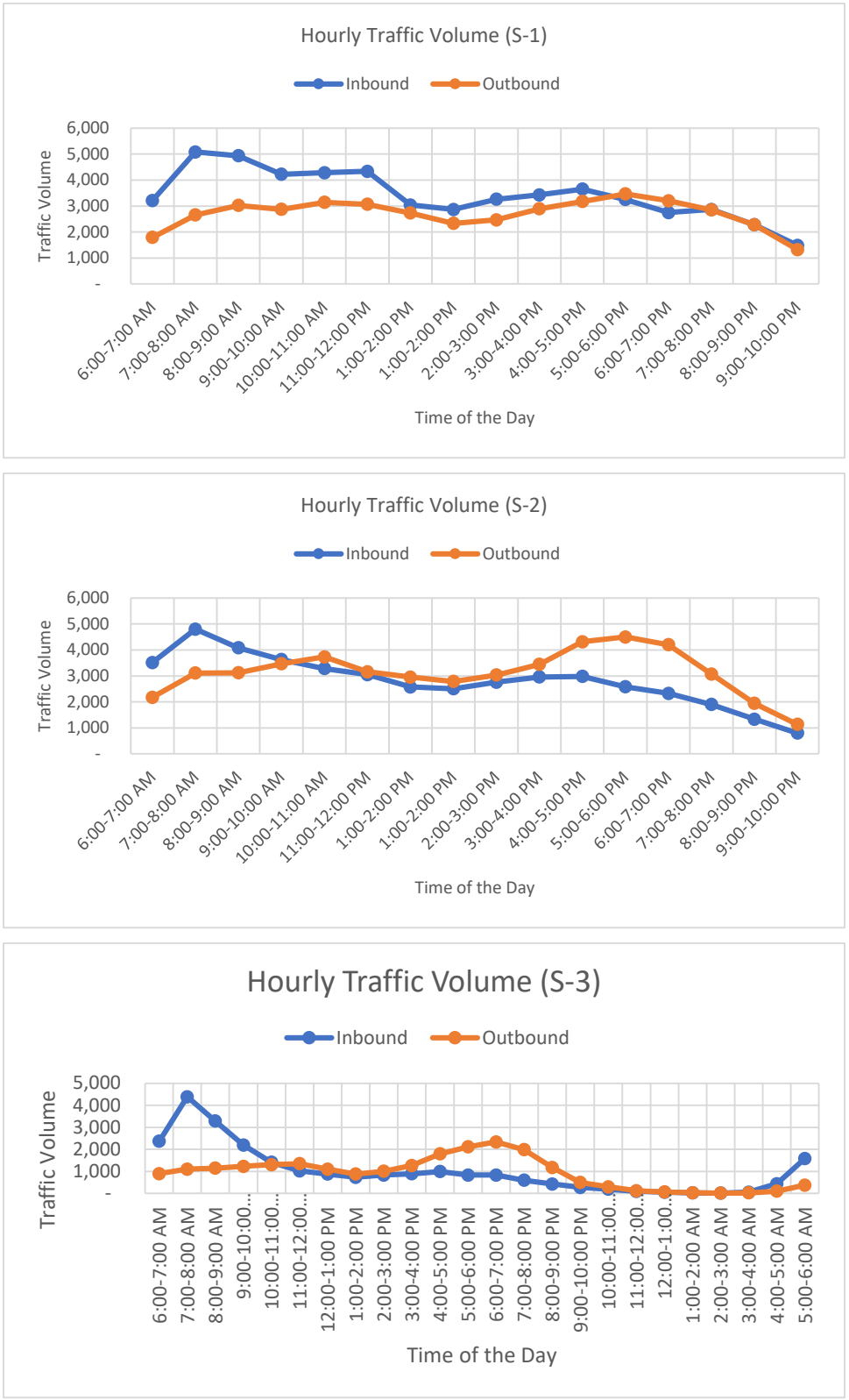


Figure 7: Variability in the Hourly Traffic Volume at the Screen Line

The average vehicle occupancy rate (person per vehicle) by vehicle type is shown in Table 5.

Table 5: Average Occupancy by Type of Vehicle at the Screen Line

Survey Station		Average Vehicle Occupancy by Vehicle Type (Person per Vehicle)				
Code Number	**Road Name**	**Micro Bus**	**Mini Bus**	**Large Bus**	**Taxi**	**Passenger Car**
S-1	Baghe Bala	7.3	12.1	23.1	2.6	2.9
S-2	Seh Aqrab	7.5	12.1	29.0	2.6	2.8
S-3	Gozargah	7.7	12.5	20.6	2.6	2.7

For the passenger counts, the sample sizes for all types of vehicles were 25930, 17944, and 11729 for S1, S2, and S3, respectively.

The details of the traffic counts in 15-min intervals and the passenger counts for the screen line can be found in Appendix C of this report.

6. Cordon Line Survey

Survey Location

Cordon Line survey was conducted at six locations as shown in Figure 8. The survey stations were located mainly at the security check points close to the boundary of the Kabul city. The selected locations helped the surveyors to collect relatively a larger sample size for the OD survey.

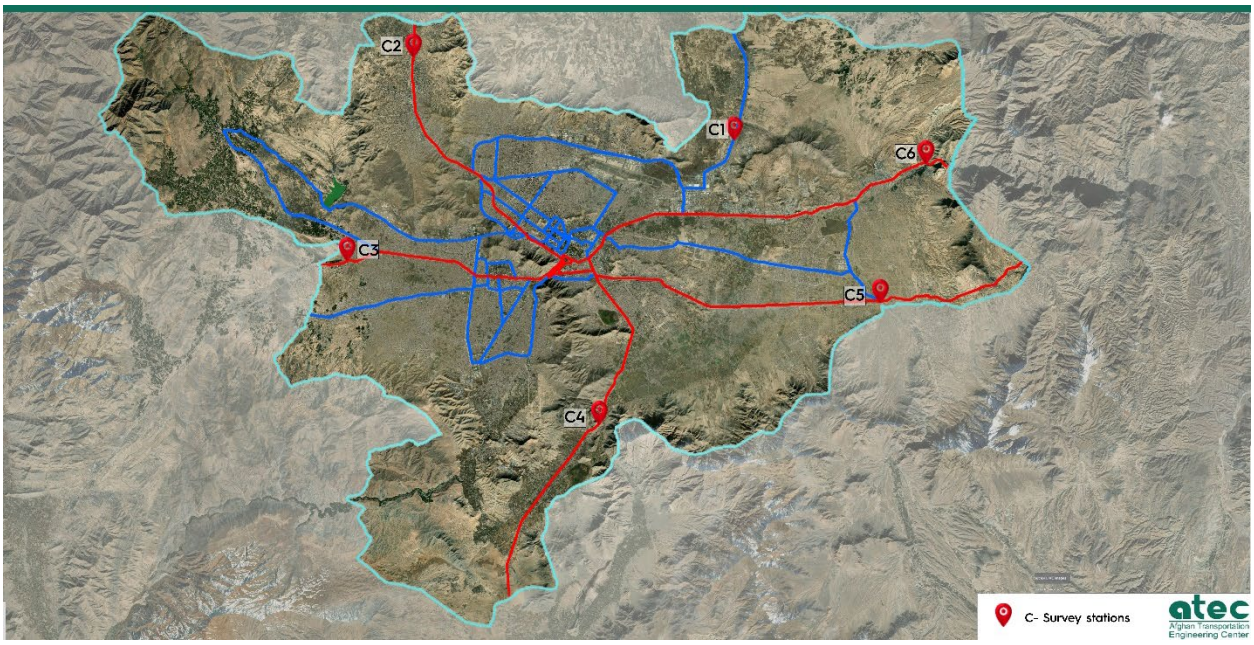


Figure 8: Survey Stations at the Cordon Line

Survey Duration

The cameras were installed for the purpose of the traffic flow video records for 24 hours at each location. Then the traffic count was conducted for 16 hours at five locations (C-1, C-3, C4, C-5, and C-6) and for 24 hours at one location (C-2) at the office utilizing the video footages. Furthermore, the OD survey was conducted at all of the stations for 16 hours and at C-2 for 24 hours. Summary of the survey is shown in Table 6.

Table 6: Summary of the Survey for the Cordon Line

Survey Station		Coverage (hours)		
Code Number	**Road Name**	**Video Records**	**Traffic Count**	**OD Survey**
C-1	Kabul-Bagram	24	16	16
C-2	Kabul-Mazar	24	24	24
C-3	Kabul-Ghazni	24	16	16
C-4	Kabul-Logar	24	16	16
C-5	Kabul-Jalalabad (Botkhak)	24	16	16
C-6	Kabul-Jalalabad (Pule Charkhi)	24	16	16

Vehicle Classification

For the traffic count purpose the vehicles were counted in the following 8 types:

- Bike/Bicycle
- Micro Bus
- Mini Bus
- Large Bus
- Taxi
- Passenger Car
- Truck
- Other (Rickshaw, 3-wheelers motorcycles, Horse cart, Wheel chair, …)

Survey Forms

Considering the study objectives, the survey forms were developed as follows, and can be found in Appendix B.

- Form-3, for OD survey

Survey Methodology

According to the project ToR, the traffic data collection at the cordon line included two components, the traffic count and the OD survey. For the traffic count cameras were deployed at the six locations for video records. Mainly two cameras (one for each direction) were installed at the stations. The cameras were

mounted between 4 to 8 meters on the existing poles or bridges. Basically, the camera views captured the rear end of the vehicles, however, in some locations front end were recorded. In either case, the records were suitable for the purpose of traffic counts and vehicle classification. The cameras were ready for operation/recording just before 6am and continued to cover the target duration with no break. Consequently, the vehicles were counted, by vehicle type and by direction, from the video footages by the data extraction team in the office.

For the OD survey, the survey crews conducted road side interview (RSI) to collect the necessary information such as origin, destination, vehicle type, and number of passengers/level of crowd and commodity for the trucks. The crews conducted OD survey close to the locations of the cameras, mainly at the security check points. The check points had two advantages, first it was secure due to the existence of the security police, and second thee crew were able to stop the drivers for interview with the help of the traffic police. The OD survey performed on the basis of sample with a size of not less than 10% of the vehicles crossing the station, however, it was desirable to have a sample size of at least 20% of the traffic volume.

Staffing

Considering the survey duration, the data collection was performed in 2 to 3 work shifts. Each shift is defined as 8 hours. For the OD survey, in each shift, there was a survey crew comprising of six people. Four persons were counting passengers (two in each direction), one served as reserve, and one was the supervisor. In addition, two traffic police were helping the crew when needed.

Survey Performance

It was planned to conduct surveys every weekday (Saturday to Thursday), one day for each location. The camera installation was successfully implemented at all of the count stations. Videos were recorded successfully for the purpose of traffic count at all of the six locations. Moreover, OD survey was conducted for 16 hours for five locations and 24 hours for one location. For the OD survey, it was tried to interview as many vehicles as possible, the sample size varied between 10% to 40% of the vehicles crossed the count station. A summary of the implemented survey is shown in Table 7.

Table 7: Summary of the Implemented Survey at the Cordon Line

	Survey Station		Coverage (hours)		
Date of the Survey	**Code Number**	**Road Name**	**Video Records**	**Traffic Count**	**OD Survey**
12 July, 2021 (Mon.)	C-1	Kabul-Bagram	24	16	16
13 July, 2021 (Tue.)	C-2	Kabul-Mazar	24	24	24
07 July, 2021 (Wed.)	C-3	Kabul-Ghazni	24	16	16
08 July, 2021 (Thu.)	C-4	Kabul-Logar	24	16	16
10 July, 2021 (Sat.)	C-5	Kabul-Jalalabad (Botkhak)	24	16	16
11 July, 2021 (Sun.)	C-6	Kabul-Jalalabad (Pule Charkhi)	24	16	16

Summary of Survey Results

The total traffic volume coming into and going out of the Kabul city, crossing the cordon line, is summarized in Table 8. The heaviest traffic was observed at Kabul-Mazar (C-2), followed by Kabul-Jalalabad (two routes, C-5 and C-6), Kabul-Ghazni (C-3), Kabul-Logar (C-4), and Kabul-Bagram (C-1), respectively.

Table 8: Summary of the Traffic Volume at the Cordon Line

Survey Station		Traffic Volume			
Code Number	**Road Name**	**Inbound**	**Outbound**	**Total**	**Duration (hour)**
C-1	Kabul-Bagram	5,490	5,264	10,754	16
C-2	Kabul-Mazar	17,249	17,370	34,619	24
C-3	Kabul-Ghazni	5,670	7,005	12,675	16
C-4	Kabul-Logar	5,816	6,215	12,031	16
C-5	Kabul-Jalalabad (Botkhak)	8,419	7,947	16,366	16
C-6	Kabul-Jalalabad (Pule Charkhi)	4,623	4,521	9,144	16

The total traffic volume coming into and going out of the Kabul city, crossing the cordon line, by vehicle type is shown in Table 9.

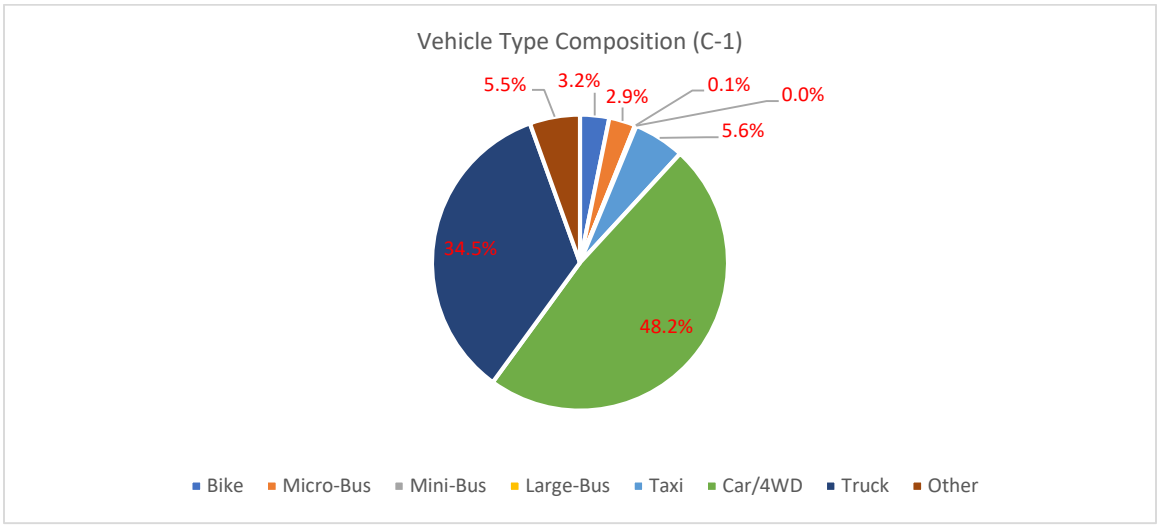
Table 9: Traffic Volumes by Vehicle Type on Cordon Line

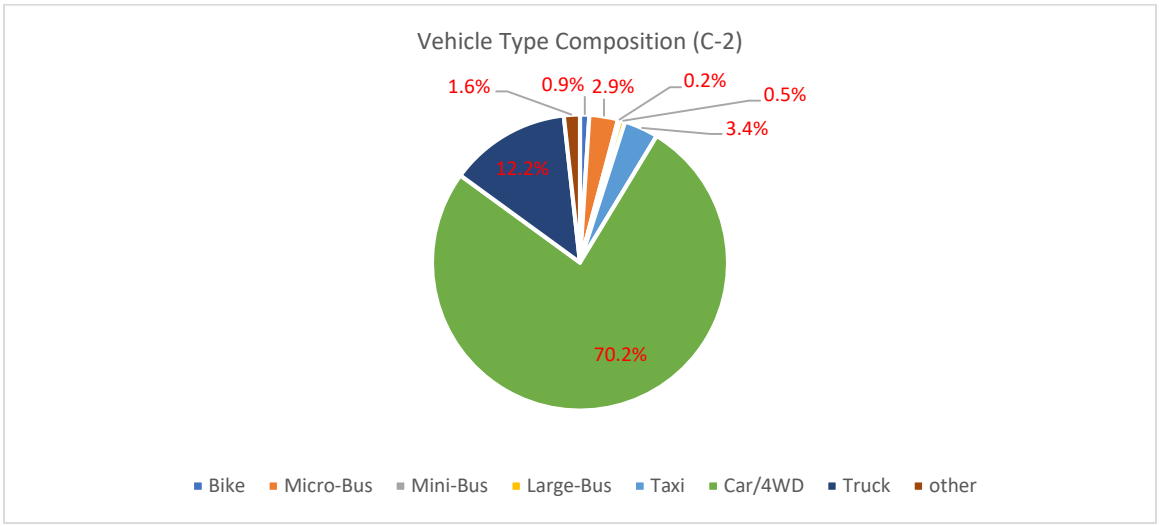
(Unit: Vehicle/16h)

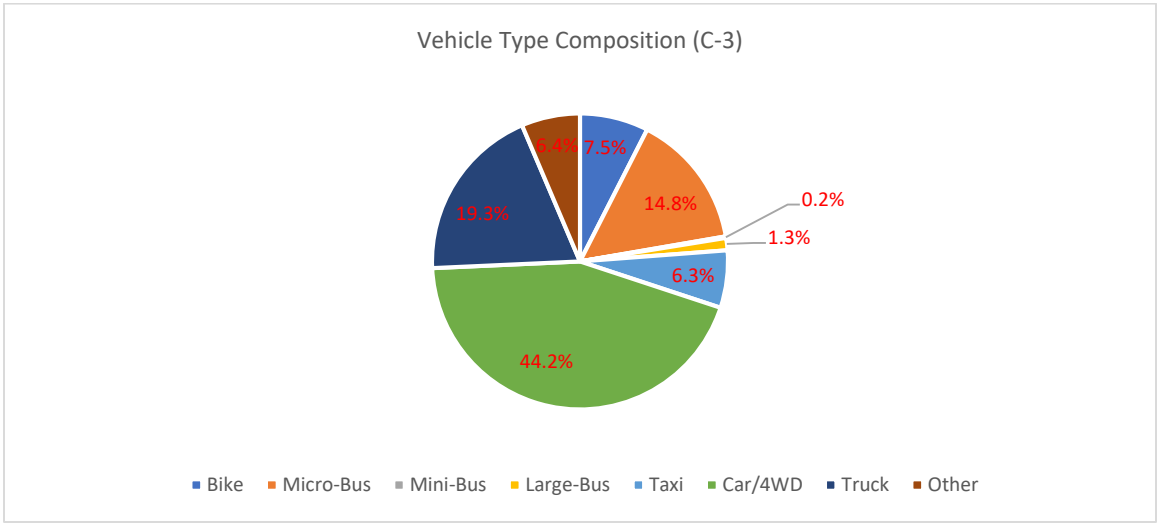
Point	Direction	Bike	Micro-Bus	Mini-Bus	Large-Bus	Taxi	Car/4WD	Truck	Other	Total
C1	Inbound	179	161	8	3	306	2,601	1,939	293	5,490
	Outbound	164	148	7	-	296	2,583	1,768	298	5,264
C2	Inbound	171	454	36	78	599	11,572	1,694	281	14,885
	Outbound	139	477	31	71	589	12,055	1,784	269	15,415
C3	Inbound	426	814	9	76	376	2,525	1,073	371	5,670
	Outbound	525	1,060	12	94	419	3,079	1,375	441	7,005
C4	Inbound	57	38	225	22	900	3,761	538	275	5,816
	Outbound	60	39	209	16	914	4,115	603	259	6,215
C5	Inbound	309	169	1	-	119	2,347	953	4,521	8,419
	Outbound	268	128	2	-	135	2,109	926	4,379	7,947
C6	Inbound	38	649	29	3	126	3,267	386	125	4,623
	Outbound	68	640	10	3	111	3,126	445	118	4,521
Total	Inbound	1,180	2,285	308	182	2,426	26,073	6,583	5,866	44,903
	Outbound	1,224	2,492	271	184	2,464	27,067	6,901	5,764	46,367
	Inbound+ Outbound	2,404	4,777	579	366	4,890	53,140	13,484	11,630	91,270
	Share	2.6%	5.2%	0.6%	0.4%	5.4%	58.2%	14.8%	12.7%	100.0%

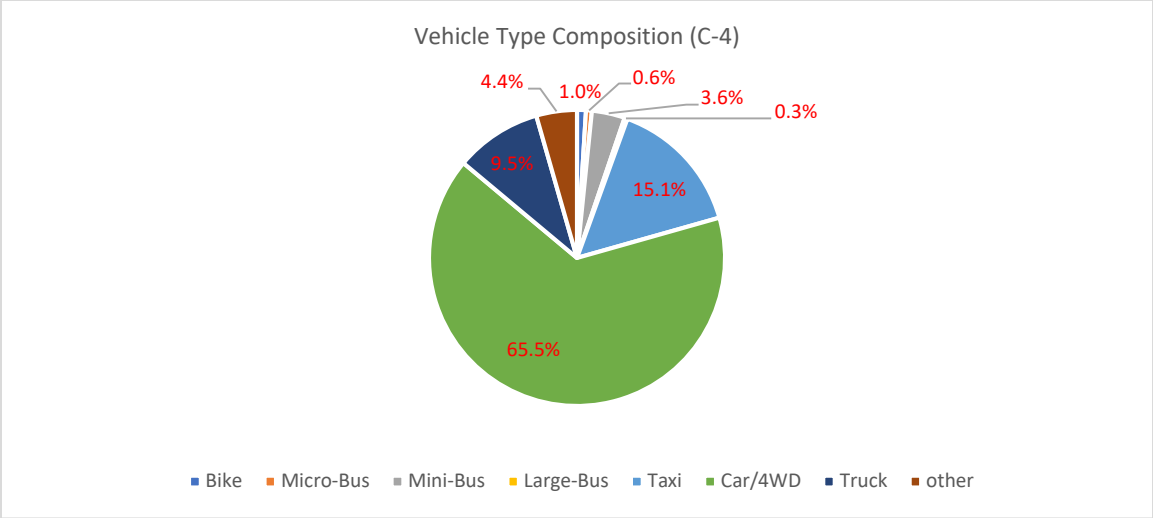
In order to convert the 16h to 24h traffic count, the conversion factors derived from the 24 hours count at C2, i.e. 1.16 for inbound and 1.13 for outbound, was used. As a result, the total 24h count can be estimated as 104,416 on the cordon line.

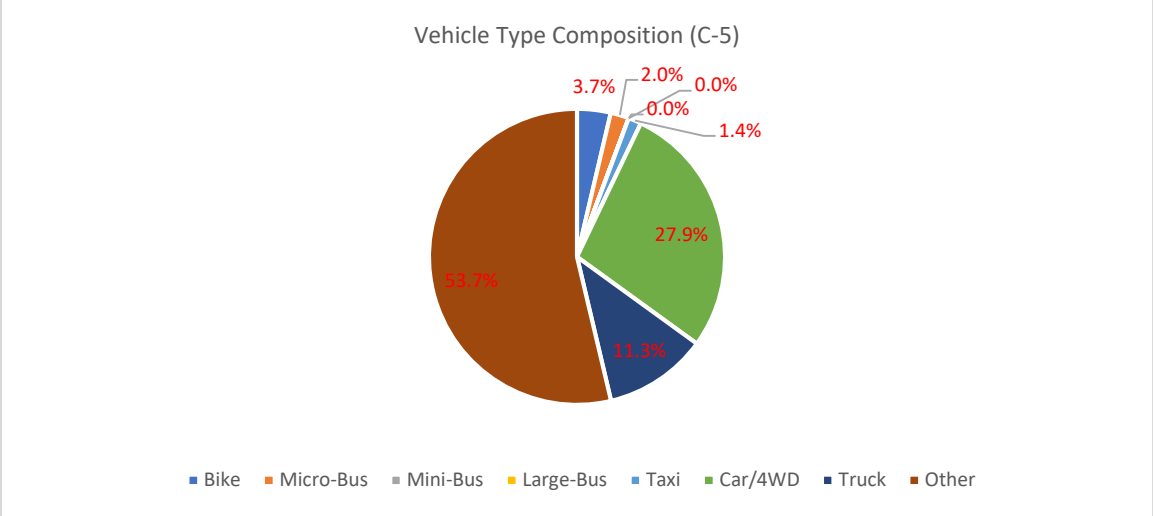
The composition of vehicle type, for each survey station, is shown in Figure 9.











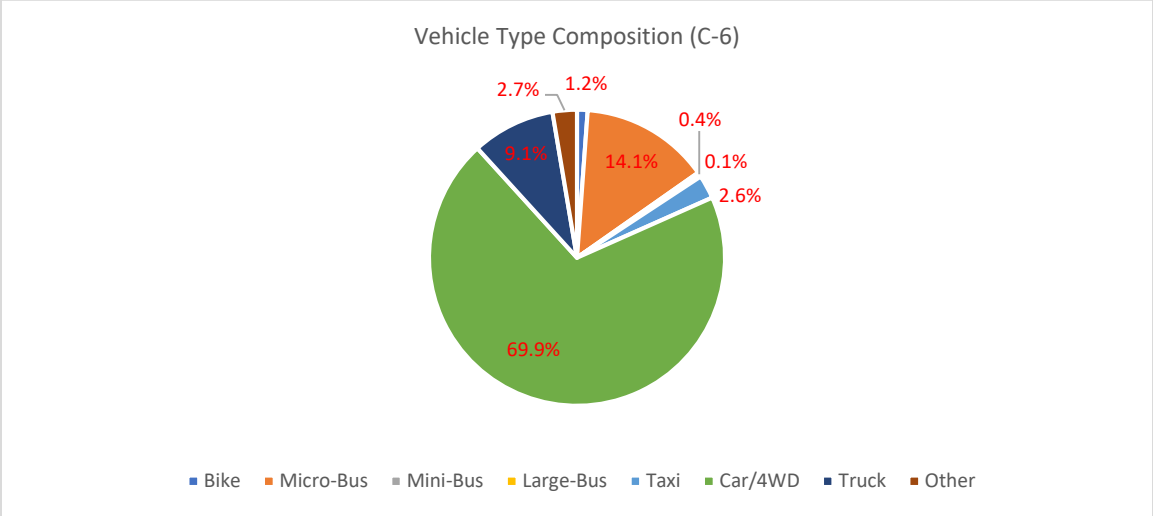
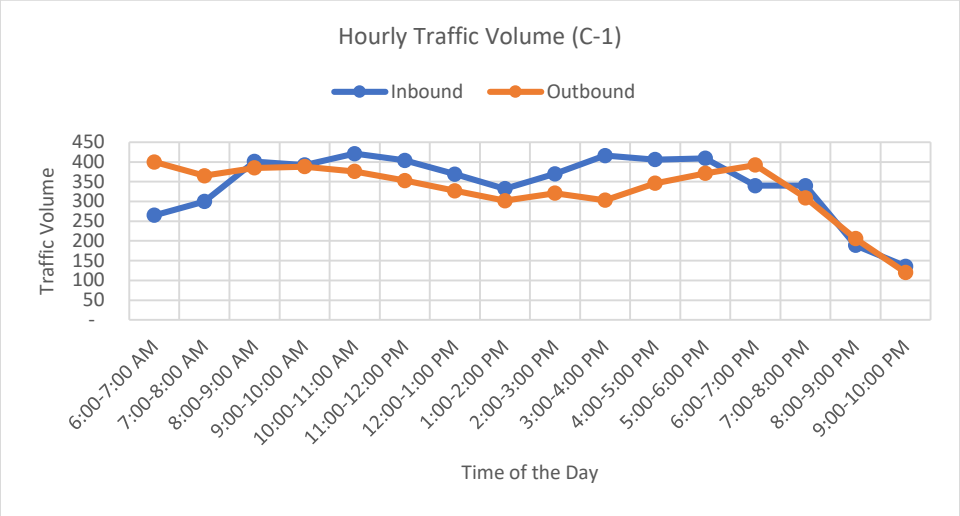
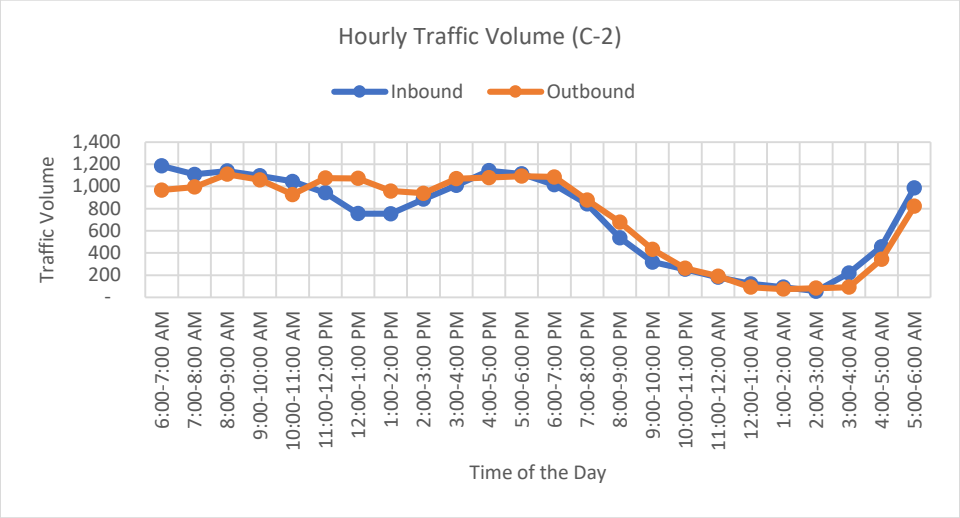
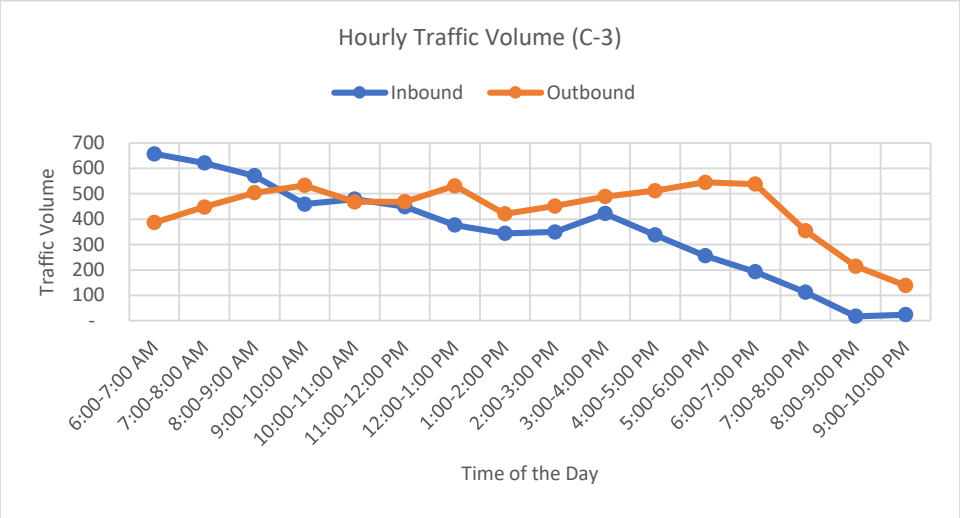


Figure 9: Composition of Vehicle Type at the Cordon Line

The variation of hourly traffic volumes for each station on the cordon line is shown in Figure 10.







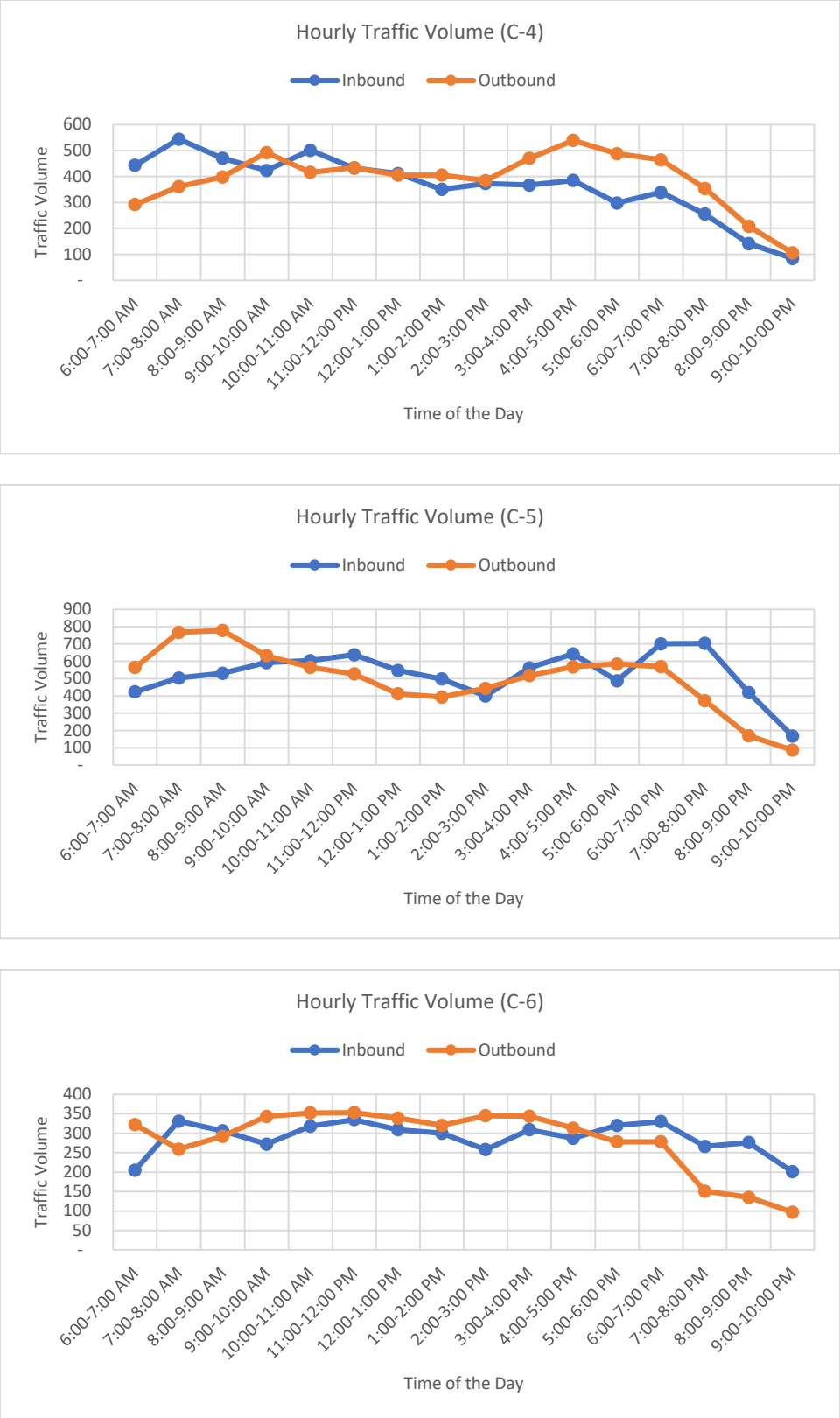


Figure 10: Variability in the Hourly Traffic Volume at the Cordon Line

The average vehicle occupancy rate (person per vehicle) by vehicle type is shown in Table 10.

Table 10: Average Occupancy by Type of Vehicle at the Cordon Line

Survey Station		Average Vehicle Occupancy by Vehicle Type (Person per Vehicle)				
Code Number	**Road Name**	**Micro Bus**	**Mini Bus**	**Large Bus**	**Taxi**	**Passenger Car**
C-1	Kabul-Bagram	8.3	8.0	23.2	4.1	3.8
C-2	Kabul-Mazar	7.3	10.2	26.8	4.5	4.1
C-3	Kabul-Ghazni	6.0	10.5	30.2	3.4	3.4
C-4	Kabul-Logar	7.3	10.2	26.8	4.5	4.1
C-5	Kabul-Jalalabad (Botkhak)	2.9	4.7	NA*	3.5	2.7
C-6	Kabul-Jalalabad (Pule Charkhi)	8.3	10.6	9.8	4.1	4.2

* Due to lack of large buses and existence of considerable percentage, Rickshaws Occupancy Rate was estimated as 3.3.

For the OD survey including the passenger counts, the sample sizes for all types of vehicles were 3984, 9960, 2138, 3558, 2087, and 3184 for C1, C2, C3, C4, C5, and C6, respectively.

The number of drivers interviewed for the OD survey, based on the vehicle type, is shown in Table 11.

Table 11: Sample Size for OD Survey based on Vehicle Type

Survey Station		OD Sample Size					
Code Number	**Road Name**	**Micro Bus***	**Mini Bus****	**Large Bus**	**Taxi**	**Passenger Car**	**Truck**
C-1	Kabul-Bagram	52	91	8	224	1885	1724
C-2	Kabul-Mazar	141	272	163	439	7568	1377
C-3	Kabul-Ghazni	67	444	65	212	784	566
C-4	Kabul-Logar	42	190	5	449	2291	581
C-5	Kabul-Jalalabad (Botkhak)	20	87	NA***	79	975	531
C-6	Kabul-Jalalabad (Pule Charkhi)	23	698	12	54	1924	473

*Tuneses were considered as Microbus.
**Astanas were considered as Minibus.
***Due to lack of large buses and existence of considerable percentage, 395 Rickshaws were interviewed.

The details of the traffic counts in 15-min intervals and the OD survey for the cordon line can be found in Appendix C of this report.