

PUBLIC TRANSPORT IN BISHKEK: PAST, PRESENT AND FUTURE

I. Background

The Kyrgyz Republic is a landlocked country in Central Asia and is bordered by Uzbekistan, Tajikistan, Kazakhstan and China. It is farther from the sea than any other country in the world. The land itself is largely made up of mountains, valleys and basins. It has a total population of 6.4 million, of which about 1.0 million live in the capital city of Bishkek. Bishkek is a city of wide boulevards and marble-faced public buildings combined with numerous Soviet-style apartment blocks surrounding interior courtyards. There are also thousands of smaller private houses, mostly outside the city center. Streets follow a grid pattern, with most flanked on both sides by narrow irrigation channels, watering innumerable trees to provide shade in the hot summers.

The collapse of Soviet Union, transition to free market economy and elimination of the centralized system of government has impacted the development pattern of the country. Since independence, the Kyrgyz Republic have gradually followed the path of transition economy, reforming its economic policies.

The transport sector in the Kyrgyz Republic followed a similar pattern of decentralization and deregulation. More than 90 percent of passenger and goods transport within the country is carried out via road transportation because of the mountainous landscape of the country and the relatively underdeveloped railroad network.

II. Urban Transport Context in Bishkek

The City of Bishkek is faced with severe challenges from the negative externalities of urban transport and the challenges are manifold. Transport demand is rapidly increasing, mainly due to a population growth of 5 percent annually (growing from 646,000 inhabitants in 2009 to over 1.0 million in 2018). Expanding city area and informal settlements on the outskirts have led to an increase in the number of trips made by residents while also increasing vehicle-km traveled. Increase in average income has led to an unprecedented growth in private car ownership at 13.7 percent annually, from 150,000 cars in 2010 to 420,000 cars in 2018. Most of these cars are second-hand, exacerbating air pollution. Moreover, the city is bisected by a railway line running east-west through the city center, resulting in bottlenecks on north-south corridors. Road design focusing on motorized transport leads to poor safety conditions for pedestrians, and traffic accidents have been increasing rapidly over time.

Most of the Kyrgyz Republic's transport infrastructure was put in place between the 1960s and 1980s. Lack of maintenance and declining funding for short-term maintenance

and longer-term renewal has gradually led to system deterioration. The disappearance of the traditional state sources of public transport subsidies, coupled with inability of the public transport systems to raise sufficient revenues through fare collection to maintain service quality, has resulted in declining levels of service and operational efficiency and effectiveness. The rigid control of public transport fares has contributed to a severe squeeze in the financial health of state-owned enterprises with a resulting decline in service standards. Most state-owned workshops in the city had virtually no stock of spare parts. The enterprises struggled to keep buses on the road through innovative “do-it-yourself” manufacture of parts and cannibalization of defunct vehicles which is costly and clearly not sustainable. Since the early 1990s, the decline was even more rapid due to political and economic turmoil. The maintenance of city roads was also neglected during that period and rolling stock, mainly trolley buses, mostly went out of circulation.

III. Evolution of Public Transport Operations

1. The Decline of the State-Owned Enterprises

In 2019, there are one municipal passenger transport company, one trolleybus company and 43 private companies providing public transport services in Bishkek. The passenger transport company operates 12 routes with 170 buses, among which 60 were newly purchased CNG buses. The trolleybus company runs 11 routes with 170 trolley buses. Based on the household survey conducted in 2011 and public transport survey conducted in 2012¹, state-owned trolley buses and large buses were of relatively minor importance in Bishkek. In total, public transport accounted for 67% of all daily motorized trips, of which 10% is transported by trolleybuses, 17% by large buses and 73% by minibuses.

Table 1: Changes in Public Transport Routes and Vehicle Units (1989 – 2019)

	1989	1995	2000	2005	2009	2012	2019
<i>Population</i>	0.65	0.71	0.76	0.79	0.83	0.87	1.03
<i># private cars per 1,000 population</i>	61	63	63	78	105	150	400
<i>Trolley Buses</i>							
<i># of Routes</i>	18	18	12	12	9	7	11
<i># of Units</i>	165	166	161	104	76	87	179
<i>Large Buses</i>							
<i># of Routes</i>	48	23	12	2	16	17	13 ²
<i># of Units</i>	452	242	114	20	261	283	186
<i>Minibuses (marshrutkas)</i>							
<i># of Routes</i>	20	28	122	178	118	118	109
<i># of Units</i>	450	750	1,150	3,046	2,262	3,800	3,754

Source: EBRD and Bishkek Transport Department

¹ Urban Transport Master Plan prepared by JICA

² Including 12 routes operated by the municipal company and one by the private company (see Box 3)

The decline in the share of regular bus fleet is the result of regulated and fixed fares which are insufficient to meet operating expenses, the high number of fare exemptions for multiple categories of people (see Box 1), and inability to provide state subsidies on a stable basis.

The current bus fare of 8 Som meets less than half of the operating cost (see Table 2). The fare level remains low and the decision to raise any fare is always very political. In Bishkek, the most recent bus fare increase was in 2012, from 5 Som to 8 Som, and they have remained the same ever since. The prior increase was in 2005, when the fares were increased from 3 Som to 5 Som.

As changes in the value of capital stock are not included in the profit and loss account, the apparently favorable balance is maintained simply by tailoring current expenditures to the cash available. Although, in principle, there is an allowance for vehicle depreciation, this is on a historic basis and the bus enterprise does not carry any effective replacement reserve account.

Box 1: List of Exemptions in Public Transport

1. Retired pensioners
2. Persons with disabilities from illness and work injury
3. Persons with disabilities from childhood
4. Children up to 7 years
5. Postmen of the State Enterprise of Postal Communication on duty

Table 2: Income and Expenses for Bus and Trolley Bus Operations, Bishkek (2018)

	Trolley bus (in million Som)	Bus (in million Som)
Total revenue	246	281
<i>Fare income</i>	114	103
<i>Subsidy</i>	132	178
Total operating expenses	244.8	270
<i>Fuel</i>	5.4	Detailed breakdown not available
<i>Electricity</i>	36	
<i>Depreciation</i>	-	
<i>Salary</i>	144	
<i>Social protection</i>	24	
<i>Spare parts/tyre/lubricate</i>	12	
<i>Miscellaneous</i>	4.8	
Gap	+1.2	-11

Source: Interview with Bishkek Passenger Transport Company and Trolley Bus Company

Bishkek Municipal Government requires public transport operators to offer free rides to special exemption groups, including school children, the elderly, persons with disability, etc., aiming to help build a caring and inclusive society. These government efforts, though with good intentions, have been difficult to enforce in real life. The common

practice is for drivers to collect fares from the riding public irrespective of whether regulations permit them to either ride free or at a discount. But since driver income are proportional to the fares collected instead of a fixed salary, it is common for them to deny service to the vulnerable population or ask them to pay the full fare. The private bus operators, in any case, do not honor passenger fare exemptions as they do not receive any public subsidies.

Due to the inadequate subsidies for public transport, regular maintenance is deferred for lack of spare parts. Over the past four years, bus availability in the enterprises has been declining at 10%-15% per annum. The average age of the state-owned bus fleets are over 10 years, which exceeds the planned life of 8-10 years and about 30% of the fleets are over 12 years old. As a result, on average, 30% of the state-owned enterprises' buses are unavailable for service at any given time (the norm is 10-15%). Almost 25%-40% of the vehicles put on road on any day break down after a few hours of operation. The bus enterprises are usually only able to provide less than half of the needed capacity indicated in service plans.

2. The Emergence of the Private Sector

After the liberalization of the urban transportation sector, a large proportion of public transport services started to be provided by private operators, mostly utilizing minibuses, or *marshrutkas* in Russian (see Figure 1). Use of personal motor vehicles has also expanded exponentially, facilitated by rising household incomes, a growing migrant population, liberal automobile import policies and a largely neglected public transport system.

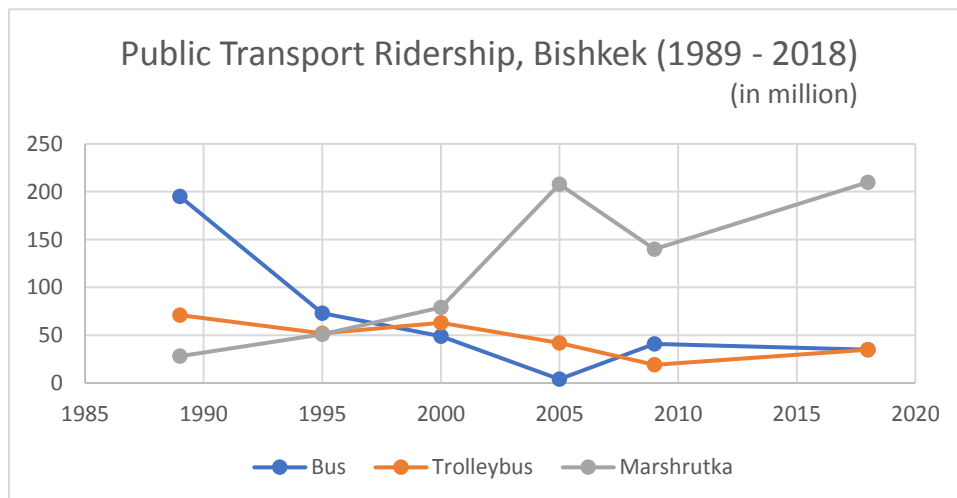


Figure 1: Change in public transport ridership in Bishkek

Today, there are 43 private enterprises, 109 minibus routes, and over 3,700 *marshrutkas* in Bishkek; about 2,400 *marshrutkas* are in daily operation on the roads. These are mainly second-hand, over 15-year old 12-seater vehicles brought into the country from Germany, Poland, Latvia, etc. The average cost of a refurbished second-hand vehicle is about USD10,000. During the evening peak hours, while large buses and trolleybuses arrive every 6-8 minutes, frequency of *marshrutkas* is in seconds. The rising popularity of these informally operated buses is encouraged by their ability to navigate narrow and poor-quality roads, serve outlying low-density areas, and flexibility in meeting diverse demand.

Franchise for minibus routes was introduced in Bishkek in November 2013. The Urban Transport Department (UTD) was assigned by the Bishkek Mayor's Office to manage the public transport operations and the tendering of the minibus routes. The franchise for each minibus route was five-year. In the beginning, a franchise fee was introduced to subsidize state-owned public transport companies. The routes are divided into three categories and the monthly franchise fee are 983 Soms, 578 Soms and 347 Soms, respectively. The franchise fee was cancelled from June 2014.

A formal contract is entered into between the UTD and each private bus enterprise, with the following features:

- The contract is valid for a period of five years;
- The contract specifies the route on which the enterprise can operate, together with the transport information including bus stops, length of the route, required minimum frequency, planned number of buses, start time, round trip time, and number of trips planned per day;
- The enterprises:
 - must obtain a license from the authorizing state body;
 - must provide annual work plans with transport service details;
 - is responsible for passenger transportation in line with technical specifications, safety requirements, quality indicators, and other terms identified in the contract;
 - submit a list of vehicles (including vehicle number, make and model, mileage, passenger capacity, safety permit);
 - retains all revenue. No paper tickets are issued, and the driver directly accepts cash from the public;
 - pays a fixed sum monthly to the city for management and monitoring (the amount as indicated above).
- The UTD:
 - prepares city transport plans, including bus routes;
 - maintains the road network, bus stops, terminals and other roadway facilities;
 - monitors compliance with contract requirements;

- manages a passenger grievance system.

Operations on the route are sub-contracted to the drivers. The drivers usually own their own vehicles and pay a fixed amount of fees to the enterprise for the access to operate on the route. They are also responsible to obtain licenses from the transport inspector and patent from the tax police. There is one exception where the company owns its own buses and leases them to the drivers. The enterprises provide depots, parking areas, maintenance workshops etc.; they also provide support to the drivers for car insurance, tax payments, trainings and consulting services in case of traffic accidents.

The current fare on minibuses are 10 Som per person-trip. Fare collection is done manually by drivers. In order to receive more income, drivers tend to compete for passengers on the road, take as many passengers as possible and work for long hours, thereby neglecting traffic rules and safety regulations. Although the contract requires the enterprises and operators to strictly abide by city regulations, there is little supervision or enforcement on the UTD or the city's part.

In addition, rising personal income has led to the exponential growth of taxis. There are over 60 legal entities in the city provide taxi services. The services are differentiated in the type of vehicles and the fare structure. There are also countless illegal private cars providing shared taxi services on the streets in the city.

IV. Current Issues and Government Response

Initially, the city government needed supplementary services and took measures to formally recognize the informal sector. However, over time, the public authorities were faced with a paradoxical situation: on the one hand, they have become increasingly concerned with the need to mobilize the private sector to overcome the shortage of government financial support for public transport; and on the other, they have a concern that the private sector would not contribute responsibly to the provision of social services not necessarily covered by operating revenue.

The increase in the share of loosely regulated private bus transport operators and taxis provides much-needed transport to people without access to private transport modes. However, their growth results in several negative externalities:

- They tend to congest public transport stops and contribute to emissions and poor air quality;
- Safety and quality standards for the provision of minibus services are difficult to enforce because of atomized nature of the operations;
- Due to climate, geography and other factors, the share of non-motorized transport modes in Bishkek is low in comparison to other places with similar socio-economic conditions: in 2013, only 26.6% of the trips surveyed were made by

walking and 0% by bike. Poor safety conditions and road design focusing on motorized transport also contribute to the negative environment for walking and cycling.

- It is estimated that 70% of GHG emissions in the city of Bishkek comes from motorized vehicles. GHG and local emissions (e.g., particulates, NO_x) affect both the global environment and the health of more than just vehicle drivers. The most affected group is children as the harmful substances are mostly concentrated just above the ground at the level of respiratory tracts of children.

Box 2: Objectives of Urban Public Transport System

Supported by broad urban development and transport strategies, the main objective of an urban public transport system is to contribute to the viability of the city by provision of efficient, equitable, accessible, adequate, convenient and affordable services, which are both safe and environmentally sustainable. In many countries, Governments have attempted to provide services by state-owned enterprises, for any of the following reasons:

- Access to transport services for all. Good public transport services facilitate economic and social activity in a city and improves quality of life for all, especially for those without access to private transport.
- Affordability. Keep fares within reach for all residents irrespective of income and disability.
- Service coverage. The need to provide services in low-density outlying areas, which are often loss-making operations. It is important to provide access to opportunities to all residents.
- Service quality. Public operators are expected to be more sensitive to quality and level of service than the private operators operating on the basis of a profit motive.
- Ability to package high-volume and low volume services. Public sector operation of services allows the opportunity to cross-subsidize loss-making operations by packaging them with high volume, profit-making routes.
- Coordination. Strong service coordination across multiple providers, modes and networks and ability to provide centralized planning and information services.
- Safety. Regulated entry is believed to facilitate better safety and higher environmental standards.
- Environmental protection. Address environmental concerns by providing alternatives to private travel.

In the past, state provision of services was believed to be the best way of achieving these objectives. However, international experience over the past many years suggests that while the public sector has a definite role to play in planning and regulation of transport services, but it can be more efficient to mobilize the private sector to actually operate public transport services under competitively procured contracts with the respective governments.

Concerned at the perceived lack of private sector to address social concerns, the city government focused on:

- Procuring new trolley and diesel buses, to be operated by state enterprises;
- Restricting the operation of private minibuses and shared taxis on select routes with significant SOE service;
- Introducing “Safe City” programs, installing surveillance cameras and additional traffic lights at major intersections;
- Restructuring bus routes to more effectively respond to user needs.

There is the belief among city officials that one large bus could potentially replace 5-6 minibuses³. Bishkek has an ambitious plan to introduce more large buses and trolley buses to the city. In April 2019, the city purchased 60 new CNG buses and they have been put into operation, running on imported natural gases. In addition, a private bus company, “Shydyr Jol”, entered into a contract with the city to operate two downtown routes with large CNG buses (see Box 3 for details). EBRD is providing support to Bishkek for the improvement of its trolley bus system in two phases. In the first phase through 2017, 79 trolley buses were procured, and power facilities were upgraded. The second phase will procure 52 more trolley buses and other equipment for trolley bus operations.

Box 3: Shydyr Jol KG LLC

Shydyr Jol KG LLC is a private company established in Bishkek in May 2015. In December 2016, it entered into an agreement with the Bishkek Mayor’s Office to provide public transport services in the city. According to the agreement, the company purchased 18 large CNG buses from China in 2017 to serve route No. 35, a circulation route in downtown Bishkek. In July 2019, it purchased another 15 buses to serve route No. 5 which also serves the urban core. Route No. 5 was later closed from September 23, 2020, due to the termination of the service agreement. The buses have a design capacity of 80 passengers and are equipped to transport passengers with disabilities and CCTV cameras to enhance security.

The company rents a depot for bus maintenance and overnight parking. It hires qualified bus drivers on a competitive basis and pays the drivers a fixed salary. The company is currently not receiving any operating subsidies from the city. The fare is 8 Som per person trip, same as the municipal bus services operated by the state-owned enterprise. The two routes operate on an interval of 4-7 minutes and are estimated to carry the respectable number of 600-700 passengers per bus per day.

³ These impressions could also be mis-founded. The ability to replace minibuses with a large bus assumes: a) there is enough demand to justify a large bus on the city network; b) the roads are wide enough, especially in the suburbs and outlying areas to support large bus operations; c) the characteristics of travel justifies a standardized, fixed route and stop and schedule response to growing demand; and d) current passenger demand levels can be maintained even with the reduced service frequency facilitated by the replacement of numerous mini-buses with fewer larger ones.

Moreover, the city plans to expand the bus and trolleybus network and replace *marshrutkas* with formal transit in the city's urban cores. There are also plans to limit the operation of *marshrutkas* at the city fringes. The exact impact of these policies on travel behavior is not clear. Currently, informal services account for over 70 percent of the public transport ridership. They serve an important purpose by providing transport to disadvantaged communities living further away from the city centers which are not covered by the formal public transport networks. In the past few years, much of the growing population of low-income migrants has settled at city fringes, often in informal settlements. These communities are often not accessible by formal public transport because the roads are neither paved nor wide enough for the large buses. Canceling the *marshrutka* services will prevent these population groups from accessing jobs, healthcare and education facilities.

For the city authorities to commit to procurement of new buses, either in response to popular demand or as a means to establish state control is nothing new. But in absence of associated reforms, the decision has often resulted in a vicious cycle with an eventual decline in the service quality (see Figure 2).

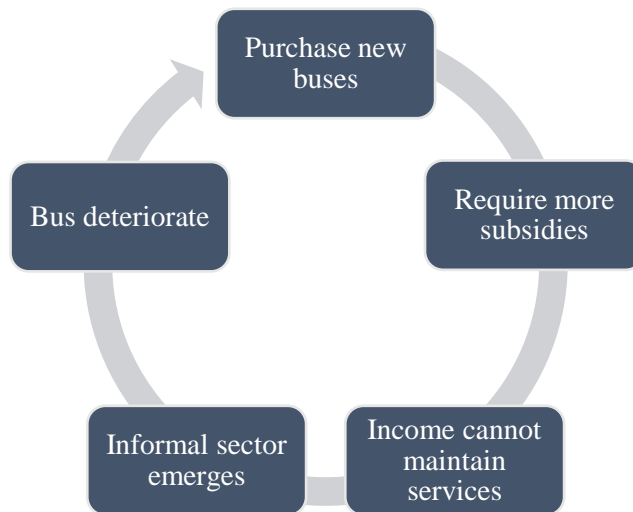


Figure 2: The vicious cycle of bus procurement

The practice followed in the city combines the worst of both models. On the one hand, fares are regulated without the benefit of protection against competition from the informal sector. The public transport buses have to compete with privately operated minibuses, taxis and shared taxis, while also respecting the lower fares and social obligations. On the other hand, private sector is allowed free entry and is loosely regulated but within a controlled fare structure domain. To survive in the market, the private sector compromises on safety and quality of services. The private buses are old, badly maintained and very crowded. The result is a public sector operator who is unable to recover operating costs and finds it difficult to maintain services, buy spare parts and fuel. The private sector provides services but of poor quality, old buses, congested and in an unsafe environment. They are not able to generate resources to replenish the vehicle stock. The public loses on both counts.

It is now well understood that the failure of city authorities to maintain a stable supply of public transport results from their inability to continue providing fiscal support coupled with difficulties in raising sufficient revenues just through fare collection. Fares have not

increased in over 8 years which has affected the bus financial situation in two ways: a) the failure to keep pace with cost inflation makes it difficult for the companies to continue providing for adequate maintenance of capital assets such as the vehicle fleet; and b) it is difficult for the public to accept sudden large fare increases after many years at the same fare unless accompanied by visible, substantial concurrent improvements in service quality. Planned gradual increase every year is a far more politically acceptable approach.

The city government is making an effort to improve the traffic regulations. Under the Safe City program, cameras have been set up at 38 intersections to control traffic flow and improve compliance with traffic rules. As a result, the number of traffic violations have reduced by over 30 percent and road accidents have been almost halved.

While the travel market share of public transport has increased over the past few years and traffic compliance has improved resulting in reduction in traffic accidents, traffic congestion continues to worsen. Travel times are long, and residents have to make multiple interchanges to get to their destinations. Environmental pollution is becoming a serious concern. The minibuses remain popular but fixed low fares makes it increasingly difficult to maintain and renew the fleet to decent standards. Institutional issues are another complex dimension. Urban transport functions are spread across multiple agencies and departments with overlapping mandates and weak capacity, particularly in planning.

V. Reform Focus

In view of declining public transport quality and performance, growing congestion and an increasing emphasis on improving the quality of life and contributing to the national economy, the city should focus on a few areas to reform the urban transport sector.

1. **Institutional Coordination for Strategy and Policy Formulation.** Specific public transport policies should ideally be part of any comprehensive urban transport and land use strategic plan. Public transport policies, in turn, should be contained in a multi-modal transport network plan which should be an integral part of a city's over-all development plan. Therefore, the objectives of transport policy must be placed in a broader development context.

It is therefore imperative to pay special attention to the relationship between spatial and transport development strategy. Key lessons from international experience include:

- All major cities should have an explicit multi-sectoral strategic plan covering land use and transport;

- Urban public transport policies must be derived from, and supported by the more general urban land use and transport strategic plan;
- Because of the technical complexity of urban transport planning, a specialized urban transport administrative function is required at the city level.

It is desirable to have a dedicated urban transport authority at the city level to improve transport delivery by bringing all transport functions into a single, well-managed and focused institutional structure. The authority should be served by a professional executive, capable of undertaking all the necessary administrative, financing, planning and monitoring tasks associated with making and implementing transport policy.

2. **Define Roles of Public and Private Sectors.** In the past, state provision of services was believed to be the best way of achieving the objectives of accessible, affordable, safe, equitable and environmentally sustainable transport. However, international experience over the past many years suggests that while the public sector has a definite role to play in planning and regulation of transport services, it is more efficient to mobilize the private sector to actually operate public transport services under competitively procured and adequately enforced contracts.

3. **Organize Public Transport Regulation.** Of the three generic forms of any market—monopoly, regulated competition and free entry—the latter two have proved the most efficient and dynamic for public transport in most countries. However, to be successful, regulated competition requires organizing the competition for the right to perform specific services, combining private sector operation with a public sector role in strategic planning and oversight/regulation. Competition is “for” the right to operate in the market, offering to supply a particular service, often exclusively, for a defined time. The role of public sector is to define the route structure, terms of operation and fare.

In the free entry model, in contrast, asset ownership, control, operations and management are completely transferred to the private sector. Competition is allowed to happen “in” the market and often the private operator is free to charge any fare within the constraints set by competitive forces in the market. The role of public sector in this model is restricted to maintaining safety or environmental standards and prohibit general monopoly and restrictive practices in accordance with the requirements of legislation of the country.

The purpose of structuring a market regime for urban transport is to find ways in which strategic government objectives can be assured while at the same time giving the private sector the incentive and freedom to operate commercially. The key to this is “managed competition” or “competition for the market”. There are various structures for this approach, ranging from management contracts, through various forms of route or area contracts to system concessions.

All managed market forms involve a continuing and substantial public sector role as designer and procurer of services, as the monitor and enforcer of service contracts and over-all regulator. The selection of an appropriate form of competition will depend not only on the technological characteristics and the current conditions of the sector but also on the nature of the social objectives and the management capability of both private and public sectors.

For regulated competition to work effectively, regulatory oversight and operational responsibilities must be separated, and entry made as free as possible to competition between commercial companies, whether in the private or public sectors. The appropriate legal basis for this will usually be a national framework law on urban public transport which permits competition for the market. Operators provide services that are specified in considerable detail by the franchising authority. Franchise contracts may vary in terms of commercial revenue risk and but usually cover investment costs of rolling stock, operating garages and maintenance depots. The franchise can cover:

- The whole system for a city
- Areas of city
- Packages of routes
- Individual routes
- Individual vehicles (vehicles are owned by individuals who are sub-franchised by the route franchise holder to operate on their behalf)

A distinction is made between gross cost and net cost franchises:

- Gross cost franchises, all revenue accrues to the government; contracts are usually let on the basis of the least total cost to the public sector. Franchisees carry production cost risk but no revenue (commercial) risk.
- Net cost franchises, the franchisee keeps all the revenues. The contract is to let to the most attractive bid and can be either positive (payment to government) or negative (payment/subsidy by the government). The franchisees carry revenue as well as cost risk.

4. **Strengthen the Contracting Framework.** The contracting and licensing arrangements between the City transport department and the public transport operating companies and taxi operators need to be strengthened based on international best practices to clarify financial responsibilities and hold the operators responsible for offering safe, secure, efficient and comfortable services. There is also a need to strengthen compliance with city policies to ensure that social objectives are met. The main requirements for a performance agreement need to include:

- Output definition
- Performance standards
- Payment conditions

- Penalties for requirements not met
- Complaints procedures
- Statement of progression over contract period

5. **Rationalize the Bus Route Network.** At present, the city has a collection of public transport routes that have evolved historically; each route serves passengers separately from the others. There can be a number of different operators on given route that are all competing against each other for passengers. There is a need to rationalize public transport routes to form a coherent and functional network with the appropriate levels of service for each. There are many other factors to consider for the network to function in an optimal manner.

One of the current issues is the multiple interchanges the users have to take to get to their final destination. An optimal transit network in any urban area should have planned interchange locations in order to avoid duplication of similar routes and an over-complication of services. Those locations should be safe, secure and protected from the weather and present opportunities for private commercial enterprises to make money that can be shared with the government to subsidize operations.

Planned interchange between services can enable highly frequent services on many routes which, despite the time penalty of interchange, would typically result in faster journey times overall, than would otherwise be the case. Currently, the majority of routes operate end-to-end without planned interchange locations, and over time passengers have learned to interchange between services on an informal basis. But this has involved making multiple payments for a single trip.

There is a need to determine an optimal network of public transport routes rather than an individual collection of routes as is the case at present. This network will use appropriate connections/ interchanges as a necessary attribute in order to avoid duplicating routes and use finite road space efficiently. Interchange locations will be strategically sited to maximize ridership and enable as efficient transfer of passengers as is possible given constraints of the road network across the cities. By planning for interchange, it is essential that service frequencies are high and schedules coordinated so that time penalties for interchange are minimized. These are objectives that must be considered in network and schedule design.

Interchange is a difficult concept to sell to the passenger as they would, more often than not, choose to travel direct without changing vehicles if that option were available to them. Interchange does bring penalties to the passenger, most notably in terms of time and, potentially, cost. A well-planned network can limit the time penalty through having highly frequent services, however it is important to limit (or preferably remove) any financial cost penalty of enforced interchanges. This would require:

- Examine the role of fare policies and ticketing strategies alongside this route rationalizing study. Together with route rationalization, there is need to implement an integrated ticketing system and appropriate fare policy that would not discourage interchange between modes and services.
- There is also a need to examine the optimal institutional and regulatory framework within which a rationalized road transit network can function and operate efficiently. The way that public transport services are currently contracted lends itself to considering routes on an individual basis. However, there is need to consider routes on a network-wide basis.
- In addition to the institutional and regulatory framework, considerations should be made that whatever network is proposed, this network will undergo constant monitoring and management to ensure that services keep pace with changes in land use and changes in passenger demand over time.
- The nature of travel demand by origin-destination and user profile need to be empirically established to optimize travel patterns of the multi-modal network and to ensure that all person needs are met efficiently. The travel needs of people differentiated by income, gender, socio-economic characteristics, age, and working conditions should be considered during planning. The travel mode most suitable to meet each differentiated need should be supported as part of the city policy.
- The way in which people currently travel around the cities is strongly influenced by the supply of transport rather than where people would actually like to travel, particularly those without access to personalized means of transport. Therefore, there is need to understand demand patterns without the existing supply constraints.

6. **Deploy Smart Mobility Solutions.** Smart mobility is the application of information and communications technology (ICT) to urban transportation systems. This enables the collection, processing, utilization and dissemination of information about multimodal urban transport in an integrated and real-time manner. It could improve the efficiency, quality of service and safety of public transport. The city has started to implement smart mobility components such as electronic ticketing and “Safe City” projects to improve its urban transport systems,

Unlike stand-alone intelligent transport systems (ITS), smart mobility is established on a platform that integrates transport data from both public and private entities as well as the ITS systems that they operate. It could facilitate the information flow among urban transport authorities and the coordination across modes and operators. Nonetheless, smart mobility is an ICT-enabled tool to support better planning, management and decision-making by people; it is only as smart as the people and entities that design such solutions. Institutional capacity for urban transport planning and management remains central to ensure the successful deployment of smart mobility solutions.

Components that other cities in similar socio-economic environment deploy in early phases typically include:

- **Public Transport Operations Management System (PTOMS).** Enabled by automatic vehicle location technology, PTOMS allows public transport operators to visualize the operations of their vehicle fleet including real-time location, speed and other status indicators. Dispatchers can use this information to monitor service performance in real time and respond to schedule variance, disruptions and/or incidents. Operators may use the data generated by PTOMS to conduct ex-post facto analyses, fine-tune planned services and monitor driver behavior. Transport oversight authorities can use the system to monitor service performance and contract compliance.
- **Passenger Information System (PIS).** PIS is an extended function of PTOMS to provide the citizens with real-time information about public transport services at various locations. PIS is provided through various means such as smart phones, websites, electronic displays at bus stops, in-vehicle electronic displays and in-vehicle audio announcements, etc. Such information helps citizens to make decisions on what travel options to choose, to plan a specific trip on public transport and to be better informed during their trips.
- **Electronic Fare Collection System (or E-Ticketing System).** E-ticketing system supports cashless payment on public transport. It encourages public transport usage by offering integrated fare payment across different services and supporting flexible fare structures (such as distance-based fares or discounts during non-peak hours). It reduces the dwell time at bus stops by hastening fare collection, thus improving operational efficiency and cost. It also prohibits passenger fare invasion and driver/conductor fraud, which promotes the financial viability of public transport operations. The city has already introduced electronic ticketing on trolley buses and diesel buses operated by the city, though there are plans to expand the system to privately operated buses and minibuses.
- **Closed Circuit TV on-Board Vehicles and in Stations and Terminals.** This can assist the police in maintaining personal security for public transport users, especially vulnerable ones such as women, the elderly and children.
- **Traffic Control System (TCS).** With the support of vehicle detection technologies such as in-pavement induction loops, infrared sensors or video cameras, TCS has become adaptive and coordinated. Modern TCS are capable of adapting to real-time traffic situation and coordinating signal timing of intersections at an area level, so as to maximize the overall transport network efficiency. It not only reduces congestion but also the associated air pollution and emissions. In addition, TCS may also interact with transit operators to provide signal priority to public transport.

- **Traffic Enforcement and Surveillance System.** Deploying cameras at intersections that detects traffic violations such as red-light running and speeding enforces traffic rules and reduces traffic accidents. Cameras may also be deployed at roadside or on buses to detect encroachment into dedicated bus lanes, thus ensuring public transport priority. In addition, CCTV cameras of high resolution are now available at lower costs. Installation of CCTV surveillance cameras in-vehicle or at bus stops and terminals could enhance the security and safety of public transport.

To achieve the desired benefits in an effective manner, the city will need to introduce institutional and technological changes focused on:

- respond to clearly stated needs of the transport authority and the operator. All of the key policy makers and senior managers of the transport authority and transport operator need to be involved at every stage, but especially at the project formulation stage. This initial analysis of transport functions is designed to assist the stakeholders in identifying the priority areas for development of their urban passenger transport system, and whether there are ITS applications that can assist in that process.
- Engage relevant transport agencies in the entire process. ICT system by itself would not resolve urban mobility issues. Smart mobility should prioritize functions that support and integrate day-to-day work of transport agencies. Close coordination and effective communications among multiple agencies that are involved in urban transport planning and management is the key to break silos in smart mobility deployment.
- Create an ITS promotion organization at the national level to bridge the public, private and academic sectors and promote the concept of smart mobility to the public. Similar organizations already exist in other countries such as ITS America, ITS Australia, ERTICO/ITS Europe and ITS China.
- Establish a smart mobility regulatory framework at the national scale, which may take the form of developing new laws and regulations as well as amending existing ones.
- Secure financing for initial smart mobility investment and ongoing operations and maintenance.
- Provide capacity building and training needs for relevant staff in the public sector to understand, develop and operate smart mobility systems.
- Promote public participation and user promotion to ensure the acceptance of any new smart mobility solutions among the general public.

At the technological level, following prerequisites are critical to ensure ICT connectivity, data exchange and processing involving multiple locations:

- Smart mobility solutions rely on wired or wireless communications for data transfer, so adequate bandwidth and coverage need to be made available for each smart mobility system. Broadband connectivity is a basic prerequisite for any ICT applications.
- Data storage and processing may take place either locally or remotely on the cloud, and adequate data storage and computing power need to be allocated for smart mobility applications in either case.
- Data format, system interface and communications protocols must be made consistent through standards to ensure the compatibility, expandability and interoperability of various smart mobility applications.
- Cyber security and privacy should be considered from the beginning of smart mobility deployment.

7. **Develop Parking Policy and Implementation Approaches.** While “congestion” remains the pre-occupation of most city planners even in low vehicle ownership developing countries, the connection between lack of a parking policy and declining general travel conditions is often missed. Poorly managed parking is a source of conflict and inefficiency, undermining city’s viability and competitiveness.

The absence of a parking management policy affects travel behavior in multiple ways:

- a) It lowers the cost of driving by providing high cost facilities (parking spaces) for free. This promotes private mobility and makes it difficult for the public transport to provide a viable alternative;
- b) Unplanned and unmanaged on-street parking takes up the road space and reduces limited road capacity;
- c) Illegal parking at designated bus stops makes bus service dangerous to access and slows up bus services, thus making highly subsidized private transport even more relatively attractive.

The result are streets clogged with motor vehicles at every possible location—parked at roadside, across curbs and walkways, on sidewalks and in recent years, even double parking. International experience suggests that the efforts by cities to provide off-street parking has not, by itself, prevented on-street chaos. The projects are expensive and user charges high. Unless supported by robust, realistic financial analyses, publicly provided off-street parking may result in low returns and thus further subsidies to private vehicle use.

Accelerated rates of car ownership, rapid urbanization and increasing density in the cities is of recent origin, so it is only in the last few years that the city governments are having to grapple with parking problems at a scale that demands a significant policy response. The city of Bishkek faces acute on-street parking problems as car ownership and use

soars. Increase in average income has led to an unprecedented growth in private car ownership at 13.7 percent annually, from 150,000 cars in 2010 to 420,000 cars in 2018. If left unchecked, the expectation of “free” parking would make it extremely difficult to change behavior, clog streets and impose heavy financial burden on the municipal purse.

The city needs a systematic approach to parking management as part of its comprehensive urban transport strategy. The conventional response to high demand for parking is to provide additional parking to accommodate increasing private car use. Abundant parking supply, especially at major travel destinations, promotes increasing private car use which results in the need for more parking. This is referred to as the cycle of private car dependency.

The objectives of parking management should be increasing efficiency of the multi-modal transport system; urban regeneration, promoting access and mobility and conflict reduction while constraining private vehicle travel demand. Proactive use of Travel Demand Management (TDM) strategies can break the cycle of private car dependency and assist with establishing more sustainable travel patterns e.g. use of public transport.

The role of technology in parking management is increasing and opens possibilities for precise parking management solutions. Below are a few examples of technological tools for parking:

- **Dynamic Wayfinding:** Real-time parking-related information to travelers associated with space availability and location so as to optimize the use of parking facilities and minimize the time spent searching for available parking.
- **Dynamically Priced Parking:** Parking fees are dynamically varied based on demand and availability to influence trip timing choice and parking location choice in an effort to more efficiently balance parking supply and demand, reduce the negative impacts of travelers searching for parking, or to reduce traffic impacts associated with peak period trip making. The parking availability is continuously monitored, and parking pricing is used as a means to influence travel and parking choices and dynamically manage the traffic demand.
- **Dynamic Parking Reservation:** Travelers can use technology to reserve a parking space at a destination facility on demand to ensure availability. The parking availability is continuously monitored, and system users can reserve the parking space ahead of arriving at the parking location.
- **Automatic License Plate Recognition:** Amsterdam has a highly technological approach in managing its transport. It has a database with car plate numbers that are linked also to emission information. The city scans car plate numbers and cross-examines the information with its database. In its city center, Amsterdam charges some of the highest fees worldwide.

VI. The Way Ahead

The ease of passenger and freight movement in an efficient and effective manner is central to maintaining the city's vitality and competitiveness. To sustain economic growth, enhance productivity, and provide equal opportunities for people from all socio-economic segments in an environmentally, financially and socially sustainable manner would require developing a phased approach to urban transport. This section outlines a broad approach for the city to develop a comprehensive urban transport plan. The suggested approach is based on initial discussions and would need to be empirically verified through further detailed investigations and data gathering.

Short Term

- Conduct surveys to understand travel patterns, demand and supply, characteristics and behavior by different population segments, disaggregated by gender, age, occupation, physical ability and income; benchmark performance in terms of physical and operational capacity, service reliability, access, and financial capacity;
- Develop urban transport strategy and parking policy;
- Develop institutional coordination options including setting up a public transport planning and oversight authority;
- Identify policy reforms and infrastructure and services investment needs;
- Prepare a national smart mobility strategy and system architecture;
- Identify high priority smart mobility projects (e.g. fare collection, public transport information system, etc.) recommended to be implemented in the short- and medium-terms, and develop preparation documents in support of the next step;
- Disseminate the findings to stakeholders in academia, industry and government authorities for their consideration, feedback and finalization.

Medium Term

- Based on an understanding of supply and demand, rationalize the public transport networks: a) develop a rational network that integrates all available options to minimize transfers, enhance last-mile connectivity and walking access; b) provide efficient public transport services to residents in outlying areas; and c) develop a high quality bus system as an attractive alternative to private vehicle acquisition and use;
- Design public transport system to offer differentiated services to different travel markets, with a mix of regular local bus and premium "guaranteed seat" services using small buses, all based on demand and passenger profiles. There is a need to view public transport as a range of offerings, each ideally suited to a different market segment;

- Finalize investment requirements;
- Identify Public-Private Partnership (PPP) opportunities and Maximizing Financing for Development (MFD) options;
- Prepare smart mobility technical standards and framework for operationalization the strategy;
- Use a variety of stakeholder communications, consultation and public participation approaches to build awareness, invite feedback and formulate sustainable, implementable solutions.