CHAPTER 6 PRESENT ROAD SECTOR ISSUES

6.1 Present Road and Traffic Issues

As previously discussed in Chapter 4 and Chapter 5, several problems were identified with the present road sector. This section discusses these various concerns and identified issues that will respond to the road sector development. Table 6.1-1 shows the identified road sector problems and issues

Table 6.1-1 Identified Road Sector Issues

Road Network	Road Condition
1. Traffic congestion on the major streets in the central city 2. International vehicles concentrate on major city roads and pass through Osh city 3. Insufficient capacity of bridge links crossing river	1. Several signalized intersections and partial roundabouts reach excess traffic capacity level 2. High occupancy of on-street parking in the central area and lack of off-street parking facility 3. Lack of a well-developed traffic management system (traffic signal control, channelization with marking, pedestrian facilities, off-street parking facilities with traffic enforcement, bus bay and etc.) 4. Poor road surface condition partially at international and national roads 5. Insufficient road safety system

6.1.1 Road Network Issues

1) Traffic Congestion on the Major Streets in Central City

Traffic congestion on the major street in the central city becomes very severe during the peak period, because the traffic is concentrated in the central city via five (5) radial arterial roads as OSI Road, Masalieva St., Kurmanjan Datka St., Alisher Navoi St.-Gapar Aytiev St. and Nookatskaya St. In addition, the traffic circulates among these radial roads across Ak-Buura River in east-west direction at the central point, therefore, traffic congestion gets more serious. It is necessary that countermeasure will be developed to increase the road traffic capacity.

2) International Vehicles Concentrate on Major City Roads and Pass through Osh City

Freight transportation in Osh city circulates among PRC, Karasuu market, neighboring countries and the Osh city market, making Osh city an important intermodal point in freight transportation. The international vehicles for the trade pass through Osh city and concentrate on the major city roads. It is necessary that road network's function for diverting will be promoted to strengthened in order to mitigate traffic congestion in the city.

3) Insufficient Capacity of Bridge Links Crossing River

Access for the west-east traffic across Ak-Buura River is limited to three (3) bridges of Navoi

St. Bridge, Abdukadirov St. Bridge and Nurmatov St. Bridge. The traffic congestion is especially observed on Navoi St. Bridge during the peak period, and other bridges have high traffic volume with traffic congestion during the peak period as well. It is important that traffic capacity of bridges across Ak-Buura River will be increased to the mitigation of traffic congestion, looking toward the future.

6.1.2 Road Condition Issues

1) Several Signalized Intersection and Roundabout Reach Excess Traffic Capacity Level

Osh central area bordered by Shakirova St., Alisher Navoi St., Kurmanjan Datka St. and Abdukadirov St. has high traffic volume during peak periods, it is seen chronic traffic congestion in the central area. Especially, signalized intersections of Masalieva St.-Alisher Navoi St. and Masalieva St.-OSI Road show an excess of traffic capacity.

In addition, Barsbek roundabout shows an excess of traffic capacity due to the concentration of vehicles in the evening, as indicated by the queue length of 300M in the north direction. Countermeasures will be required to increase the traffic capacity of the roundabout. It indicates that there are significant gaps between road space supply and vehicular traffic demand. It is therefore necessary that these bottlenecks will be improved to increase the traffic capacity, by using traffic management measures in short terms.

2) High Occupancy of on-street Parking in Central Area and Lack of off-street Parking Facilities

Above-mentioned traffic congestion area has a high on-street parking occupancy at 70%-100% in all day. This is the main cause of traffic congestion at signalized intersections because of the reduction of the traffic capacity on major roads. It is highly recommended that the off-street parking facilities should be developed, such as underground parking, multilevel car parking towers and on-street parking ticket systems, in addition to the parking enforcement of unregulated on-street parking.

3) Lack of a Well-developed Traffic Management System

Chronic traffic congestion in the CBD area is mainly caused by waiting for traffic lights to change, traffic spill-back from upstream, entrance and exit from/to roadside parking, stops of mini-bus/taxi at near intersections, pedestrian crossing and the reduction of traffic capacity due to on-street parking. Such behaviors are caused by the lack of a well-developed traffic management system. Traffic management systems are particularly important to make the maximum use of the existing road facilities and to improve current road capacities. It is highly recommended that a traffic management system will be introduced, such as a traffic signal control system of pre-timed operation with multi-program/coordinated control system, the construction of off-street parking facilities together with traffic enforcement of on-street

parking, a channelization system with road markings, pedestrian facilities and the installation of bus bays for mini-buses and taxies.

4) Poor Road Surface Conditions Partially at International Roads and National Roads

Segments of international roads on M41 Road, North Bypass, Kokum Bii St. and the entrance of the planned South Bypass Road of Osh City are in a poor/or bad road surface condition. The road condition should be improved to ensure a smooth traffic flow and road safety.

5) Insufficient Road Safety Countermeasures

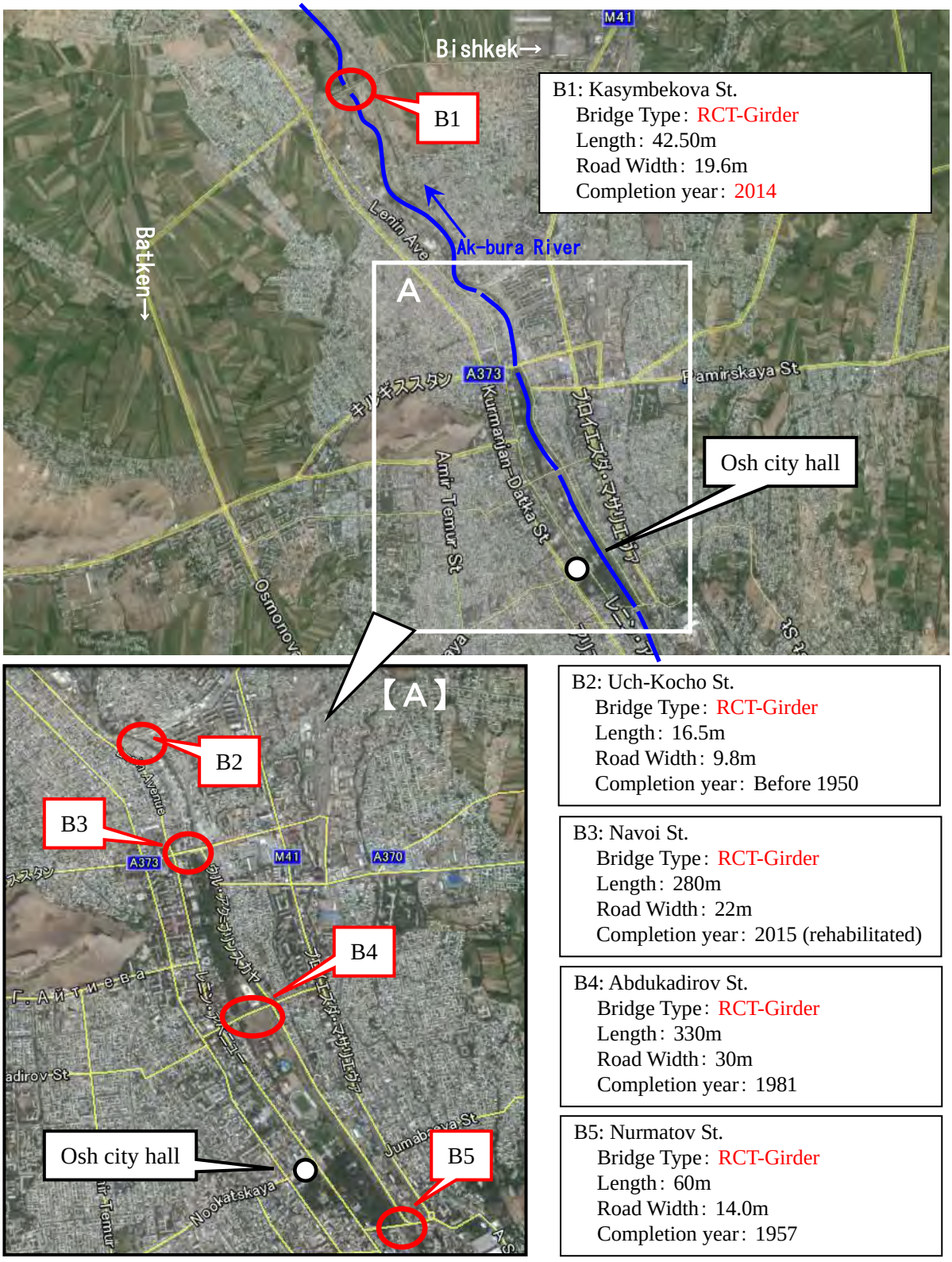
Of all total accidents in Kyrgyz, it should be noted that the share of traffic accidents involving pedestrians is high at 33.9%. It indicates the importance of the lack of a well-developed road safety facility with “Pedestrian Friendly” structures, such as pedestrian bridges and pedestrian crossings. On the other hand, accidents caused by speeding, violations of the rules of maneuvering and violations of overtaking rules are equally representing a high share. There is a lack of compliance with the traffic rules, and it is concluded that these accidents are mainly caused by the wrong driving manners of road users. Countermeasures from the hardware aspect of traffic safety facilities and the reinforcements from the software aspect of road safety education and traffic enforcement are necessary.

6.2 Present Condition and Problems of Existing Bridges

6.2.1 Summary of Existing Bridges in Osh City

1) Location and Specifications

The locations and specifications of bridges in Osh city are shown below.



Source: JICA Survey Team

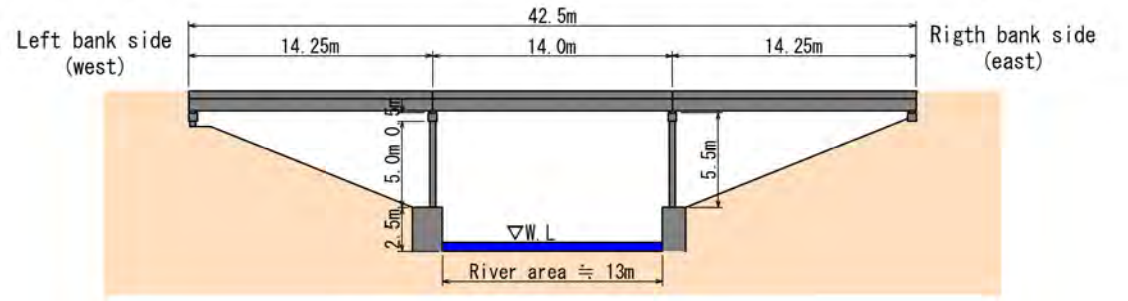
Figure 6.2-1 Locations and Specifications of Bridges in Osh City

2) Role of the Bridges

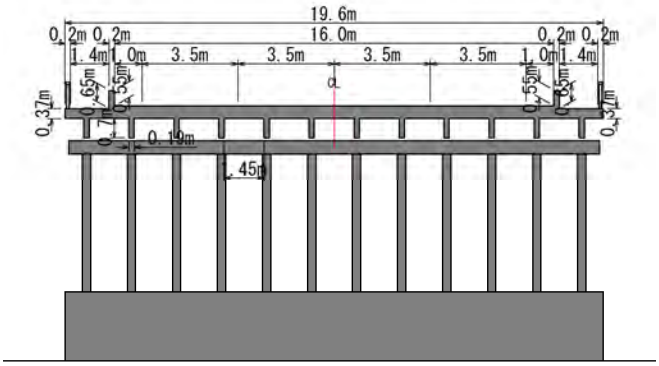
i) The Bridge on Kasymbekova St.

The road is located in the suburbs of Osh city. This road is a link road between Bishkek city, which is the capital city of the Kyrgyz Republic, and the State of Batken. The bridge on the link road is located on the north side of the city and crosses Ak-Buura River. The road opened to traffic in 2014, but the bridge was completed before. Large vehicles and private and public cars cross the bridge at relatively high speeds because the road alignment of this bridge is straight and visibility is good.

Side elevation of the whole bridge with dimensions



Cross section of piers with dimensions



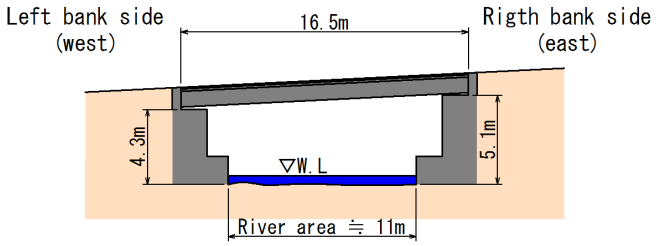
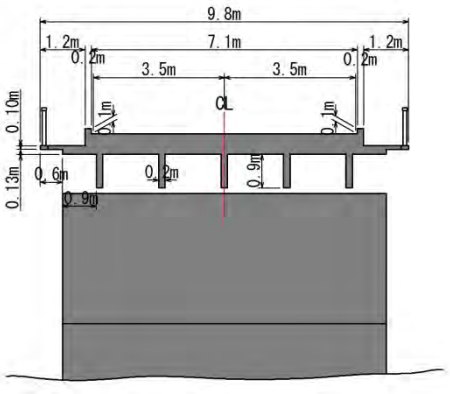
Picture of the road on the bridge

Source: JICA Survey Team

Figure 6.2-2 The Bridge on Kasymbekova St.

ii) The Bridge on Uch-Kocho St.

This bridge is located at the bazaar of Osh city. The road on the east side of the bridge has been widened to 4 traffic lanes. However, the area around bridge has not yet been widened because of the shops in the bazaar being too close to the bridge. It is possible that relocating the shops will take a long time. This bridge crosses Ak-Buura River and is used as a link road between the left bank and the right bank of the bazaar. The road in the bazaar has a lot of on-the-street parking and overflows with people, so the through traffic must be careful to avoid them.

Side elevation of the whole bridge with dimensions	
	
Cross section of piers with dimensions	Picture of the road on the bridge
	

Source: JICA Survey Team

Figure 6.2-3 The Bridge on Uch-Kocho St.

iii) The Bridge on Navoi St.

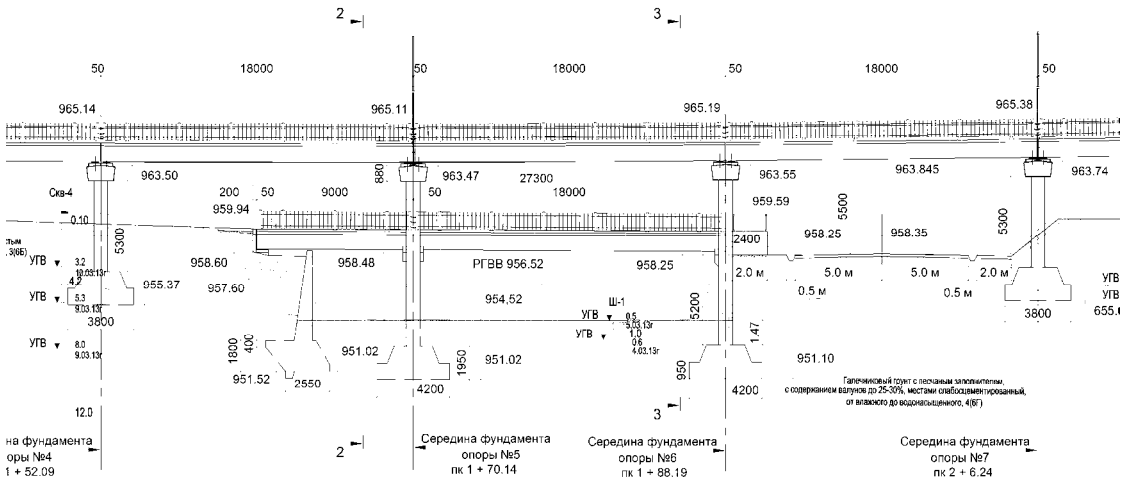
This bridge is a viaduct that links important roads from east to west in Osh city. The traffic crossing this bridge consists of only private and public cars, as specified by Osh city, and there is a heavy traffic. This bridge was completed with help from the Russian Federation in 2015. This bridge crosses the road to the airport and the Ak-bura River, and there are some restaurants under the bridge.

Picture (1)	Picture (2)
	

Source: JICA Survey Team

Figure 6.2-4 The Bridge on Navoi St.

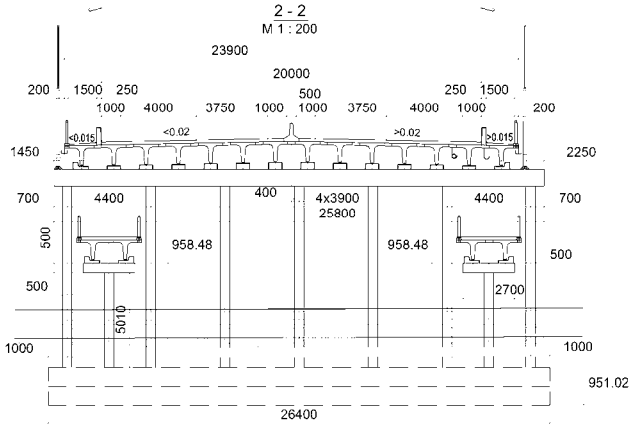
River condition



・The river width is about 24m from drawing of lending references.

・The bottom of the river is 954.52m, the surface of the river is 956.52m, the height of the water is 2.0m.

Superstructure and pier



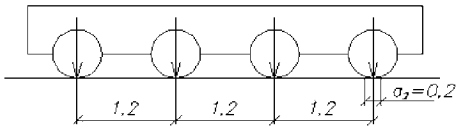
・The foundation type is a spread foundation.

・The pier has some props (500mm×800mm). In the Japanese standard, some props in the river are prohibited because it is possible to scour or overflow from being caught by anything because of this shape.

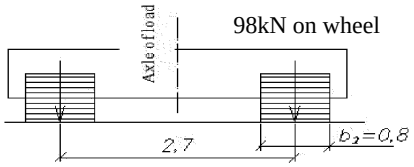
・The superstructure is RCT-girder.

Live load

196kN on axle

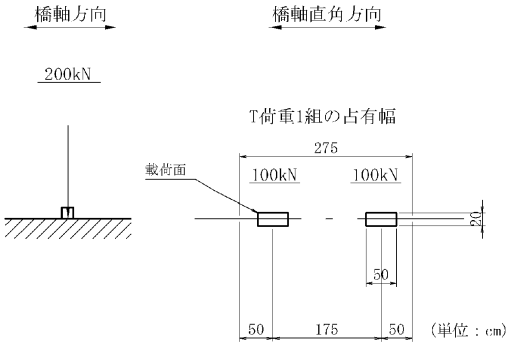


98kN on wheel



・The live load adopts "HK-80" according to SNIP.

・In the Japanese standard (only T load is attached for comparisons), the standard value does not have the big difference as follows.



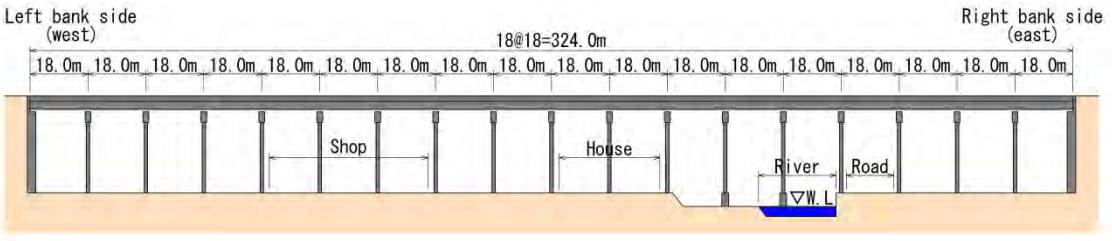
Source: JICA Survey Team

Figure 6.2-5 The Bridge on Navoi St. from Lending References

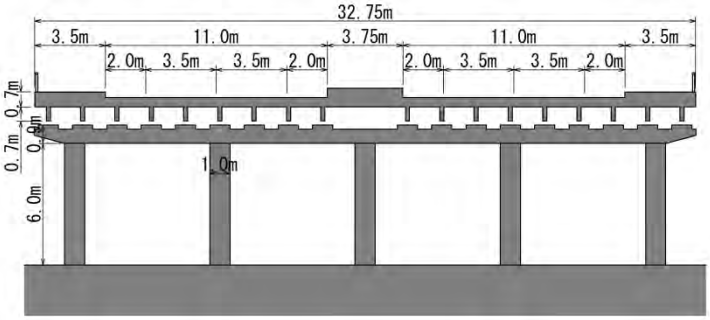
iv) The Bridge on Abdukadirov St.

This bridge is a viaduct that links important roads from east to west in Osh city, similar to the bridge on Navoi St. The traffic crossing this bridge consists of private and public cars only, as specified by Osh city, and there is a heavy amount of traffic too. This bridge crosses the road to the airport and Ak-bura River, and there are some restaurants under the bridge. This bridge was completed 34 years ago and there is significant damage/deterioration.

Side elevation of the whole bridge with dimensions



Cross section of piers with dimensions



Picture of the road on the bridge

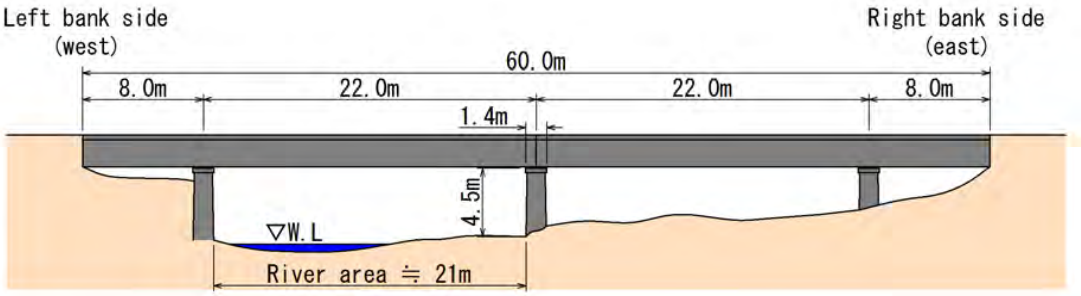
Source: JICA Survey Team

Figure 6.2-6 The Bridge on Abdukadirov St.

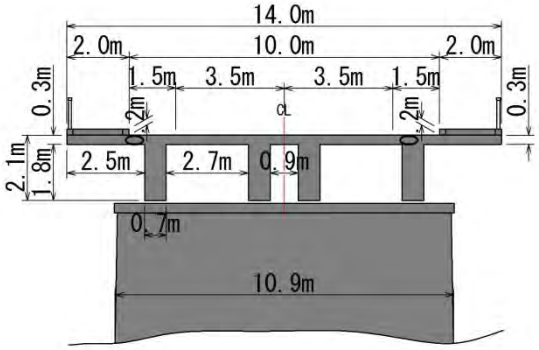
v) The Bridge on Nurmatov St.

This bridge is south of Osh city hall. This bridge links important roads from the east to the west in Osh city, similar to the bridge on Navoi St. and the bridge on Abdukadirov St. Large vehicles are permitted to use only this bridge. At the east end of the bridge, there is a connecting road to the airport on the north side, but east-bound traffic is prohibited from turning left onto this connection road. This bridge was completed 58 years ago and there is significant damage/deterioration of the slab and girders.

Side elevation of the whole bridge with dimensions



Cross section of piers with dimensions



Picture of the road on the bridge

Source: JICA Survey Team

Figure 6.2-7 The Bridge on Nurmatov St.

6.2.2 Condition of Existing Bridges

1) Structural Appraisal for Each Bridge

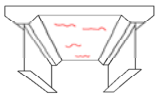
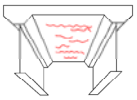
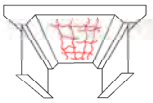
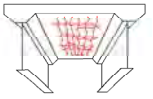
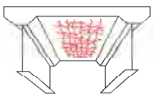
i) Survey Methodology

Structural appraisals were conducted for the Study in accordance with the damage evaluation criteria (a. to e.) of the Ministry of Land, Infrastructure, Transport and Tourism, Japan. The details of the evaluation criteria are shown below. The survey consists mainly of visual inspections at a distance and visual inspections in close proximity if close access is possible.

a) Damage State to be Determined and Recorded *main bridge structure

Structure	Member	Material	Damage	Possibility of confirmation		Damage evaluation criterion (a ~ e) (Reference : Ministry of Land, Infrastructure, Transport and Tourism, MLIT in Japan))
				Visual inspection (from a distance)	Visual inspection (closer)	
Super-structure	Deck Slab	Concrete	Spalling/ Rebar exposure	○	○	a:Not found, b:-, c:Peeling, d:Rebar exposure(small), e:Rebar exposure(big)
			Water leakage/ Free lime	○	○	a:Not found, b:-, c:Water leakage, d:Free lime, e:Free lime+Rust fluid
			Crack	○	○	Appendix
			peeling off	△	○	a:Not found b:- c:- d:- e:Found
			Loose part	△	○	a:Not found b:- c:- d:- e:Found
	Main Girder	Steel	Corrosion	○	○	Appendix
			Crack	×	○	a:Not found b:- c:Crack of paintingcoating d:- e:Absolute crack
			Loosen / dropping of bolts	△	○	a:Not found, b:-, c:less than 5% of total, d:-, e:more than 5% of total
			Fracture	△	○	a:Not found b:- c:- d:- e:Found
			Deterioration of anti-corrosion function	△	○	a:Not found b:- c:Partial loose part d:Spalling e:Spalling and spot rusting
		Concrete	Crack	○	○	Appendix
			Spalling/ Rebar exposure	○	○	a:Not found b:- c:Peeling d:Rebar exposure(small) e:Rebar exposure(big)
			Water leakage/ Free lime	○	○	a:Not found b:- c:Water leakage d:Free lime e:Free lime+Rust fluid
			Loose part	△	○	a:Not found b:- c:- d:- e:Found
Substruct ure	Body	Concrete	Crack	○	○	Appendix
			Spalling/ Rebar exposure	○	○	a:Not found b:- c:Peeling d:Rebar exposure(small) e:Rebar exposure(big)
			Water leakage/ Free lime	○	○	a:Not found b:- c:Water leak d:Free lime e:Free lime+Rust fluid
		Concrete block/ masonry	Deformation	○	○	a:Not found b:- c:- d:- e:Found

【Crack on slab】

	Crack phenomenon	
a	【Crack spacing & crack characteristic】 Crack has occurred only on one direction and more than 1.0m as minimum crack spacing. 【Crack width】 Less than 0.05mm of maximum crack width (such as hair-crack)	
b	【Crack spacing & crack characteristic】 Crack has mainly occurred on one direction and crack spacing of between 1.0m ~ 0.5m, but not square-block type. 【crack width】 Mainly less than 0.1mm, but partly over 0.1mm.	
c	【Crack spacing & crack characteristic】 Crack has occurred on about 0.5m before square-block type. 【Crack width】 Mainly less than 0.2mm, but partly over 0.2mm.	
d	【Crack spacing & Crack characteristic】 Crack has occurred on 0.5m ~ 0.2m and also square-block type. 【Crack width】 Over 0.2mm and partly peeling off concrete	
e	【Crack spacing & Crack characteristic】 Crack has occurred on less than 0.2m and mainly square-block type. 【Crack width】 More than 0.2mm and continuously peeling off concrete	

【Corrosion on steel】

	Corrosion phenomenon
a	Nothing
b	Corrosion has ocuurred on steel surface, but impossible to see reduction of its thickness. Furtheremore very minor area of corrosion damage.
c	Corrosion has occurred on steel surface, but impossible to see reduction of its thickness. And crack has occurred entirely on focusing parts or some spred area.
d	Corrosion has occurred on steel surface, also possible to see slightly reduction of its thickness. And crack has occurred entirely on focusing parts or many spred area.
e	Corrosion has apparently expanded on steel surface, also possible to see definitely reduction of its thickness. And crack has occurred entirely with many spred area.

【Crack on concrete structure】

	Crack phenomenon
a	Nothing
b	Small crack width (less than 0.2mm in case of RC structure) , large crack spacing (over o.5m in case of minimum crack spacing)
c	Small crack width (less than 0.2mm in case of RC structure) , small crack spacing (over o.5m in case of minimum crack spacing)
	Or modest crack width (more than 0.2mm less than 0.3mm in case of RC structure) , large crack spacing (more than 0.5m in case of minimum crack spacing)
d	Modest crack width (more than 0.2mm less than 0.3mm in case of RC structure) , small crack spacing (more than 0.5m in case of minimum crack spacing)
	Or large crack with (more than 0.3mm in case of RC struture) , large crack spacing (more than 0.5m in case of minimum crack spacing)
e	Large crack width (more than 0.3mm in case of RC structure), small crack spacing (less than 0.5m in case of minimum crack spacing)

Source: JICA Survey Team prepared based on materials of MLIT

Figure 6.2-8 The Evaluation Criteria of Bridges (1/2)

b) Damage State to be Determined and Recorded *bridge components and accessories

Structure	Member	Kinds of damage	Contents	Damage evaluation criterion (a ~ e) (Reference : Ministry of Land, Infrastructure, Transport and Tourism, MLIT in Japan))
Bearing shoe	Shoe	Functional deficit	Severe corrosion, damage/hardening/missing of parts	a:Not found b:- c:- d:- e:Functional deficit due to damage
		Extraordinary noises	Extraordinary noises in case of passing of vehicle	a:Not found b:- c:- d:- e:Found
	Mortar	Clogging with soil	Clogging with soil and water	a:Not found b:- c:- d:- e:Found
		Deformation･ Deficit	Crack of mortar, partial deficit	a:Not found b:- c:Partially found d:- e:Severely deficit
Ancillary facilities	Railing, Guardrail	Deformation･ Deficit	Broken due to collision of vehicle Dangerous location for passangers	a:Not found b:- c:Partially found d:- e:Severely deficit
Deck surface	Pavement	Abnormity on pavement	Hole, big pothole, crack	a:Not found b:- c:- d:- e:Crack width is more than 5mm, etc
		Unevenness on road surface	Dangerous parts for passangers	a:Not found b:- c:less than 2cm d:- e:more than 2cm
	Expansion joint	Unevenness on road surface	Big gaps	a:Not found b:- c:less than 2cm d:- e:more than 2cm
		Abnormity at expansion gap	Broken	a:Not found b:- c:Small disconnect d:- e:Disjunction or contact
Drainage facilities		Clogging with soil	Clogging with soil and overlay	a:Not found b:- c:- d:- e:Found
		Water leak, Bearing water	Drainage facilities are broken and girder is directly afftected by drained water, etc.	a:Not found b:- c:- d:- e:Water leakage･ Bearing water
Whole bridge		Extraordinary deflection	Extraordinary deflection is found	a:Not found b:- c:- d:- e:Found
		Settlement, movement, tilting	Settlement, movement, incline at foundation and bearing, etc.	a:Not found b:- c:- d:- e:Found
		Scouring	Scouring at pier, foundation	a:Not found b:- c:Scouring d:- e:Severe scouring
		Others	Illegal occupation, graffiti, damage by birds, damage by fire, etc.	Only record

Source: JICA Survey Team prepared based on materials of MLIT

Figure 6.2-9 The Evaluation Criteria of Bridges (2/2)

ii) Evaluation Results

Survey results are summarized as below. Survey results are summarized in following tables and photos of each bridge conditions are also shown.

[Summary of Bridge Conditions]

- The Bridge on Kasymbekova St. Slabs have spalling and rebar exposures. In front of a revetment is damaged.
- The Bridge on Uch-Kocho St. Bridge condition is rather good. Slope protection at beside revetment is required.
- The Bridge on Navoi St. Bridge is newly constructed and in good condition. Expansions are not well constructed and have water leakages.
- The Bridge on Abdukadirov St. Spalling and rebar exposures are observed at many places. Slabs should be repaired or reconstructed before falling down.
- The Bridge on Nurmatov St. Spalling and rebar exposures are observed at many places. Applied design standard seems old because exposed rebars are round bars, so that enhancement of the bridge by repairs or enforcements are not able to be strong enough. Therefore reconstruction is recommended.

a) Main Bridge Structure

Table 6.2-1 Evaluation Results (Main Bridge Structure)

Structure	Member	Damage	B-1	B-2	B-3	B-4	B-5
Super structure	Slab	Spalling Rebar exposure	d	a	a	e	e
		Water leak Free lime	a	a	a	c	a
		Crack	a	a	a	a	a
		Peeling off	a	a	a	a	a
		Loose part	a	a	a	a	a
	Girder	Crack	a	a	a	a	a
		Spalling Rebar exposure	a	c	a	d	d
		Water leak Free lime	a	a	a	a	a
		Loose part	a	a	a	a	a
Sub structure	Body	Crack	a	a	a	d	a
		Spalling Rebar exposure	d	c	a	e	c
		Water leak Free lime	a	a	a	a	a
Revetment		Deformation	e	e	-	-	e

b) Bridge Components and Accessories

Table 6.2-2 Evaluation Results (Bridge Components and Accessories)

Structure	Member	Damage	B-1	B-2	B-3	B-4	B-5
Bearing shoe	Shoe	Functional deficit	a	a	a	a	a
		Extraordinary noises	a	a	a	a	a
	Mortar	Clogging with soil	e	e	a	e	e
		Deformation	a	a	a	a	a
Ancillary facilities	Railing	Deformation	a	c	a	a	c
Deck surface	Pavement	Abnormity on pavement	a	a	a	e	e
		Unevenness on road surface	a	a	a	a	a
	Joint	Unevenness on road surface	Cannot find	Cannot find	a	Repaired	Cannot find
		Abnormity at expansion gap	Cannot find	Cannot find	c	Repaired	Cannot find
Drainage facilities		Clogging with soil	Nothing	Nothing	Under construction	Nothing	e
		Water leak Free lime	Nothing	Nothing	Under construction	Nothing	-
Whole bridge		Extraordinary deflection	a	a	a	a	a
		Settlement, movement, tilting	a	a	a	a	a
		Scouring	a	a	a	a	a
		Others	a	a	a	a	a

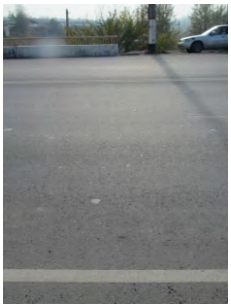
Source: JICA Survey Team

c) The Bridge on Kasymbekova St.

Bridge Name		The bridge on Kasymbekova St.	Road Name	Kasymbekova St.
Site Condition	Location	From Bishkek side	Location	From Batken side
				
	Location	From downstream of Bishkek side	Location	From downstream of Batken side
				
	Location	From upstream of Bishkek side	Location	From upstream of Batken side
				
	Location	Downstream direction	Location	Upstream direction
				

Source: JICA Survey Team

Figure 6.2-10 Photos of the Bridge on Kasymbekova St. (1/2)

Bridge Name		The bridge on Kasymbekova St.			Road Name	Kasymbekova St.		
Damage photo	Component	Slab			Component	Girder		
	Damage	Rebar exposure	Level	d	Damage	—	Level	a
	Condition	Rebar exposure between each girder			Condition	Good		
								
	Component	Pier			Component	Revetment		
	Damage	Rebar exposure	Level	d	Damage	Deformation	Level	e
	Condition	Deterioration possibly due to poor construction			Condition	Possibility of damage to the abutment		
								
	Component	Bearing shoe			Component	Railing		
	Damage	Soil	Level	e	Damage	—	Level	a
	Condition	Soil surrounding shoe			Condition	Good		
								
	Component	Pavement and Joint			Component	Drainage facilities		
	Damage	—	Level	—	Damage	—	Level	—
	Condition	Pavement: good, Joint: cannot be found			Condition	None existent		
								

Source: JICA Survey Team

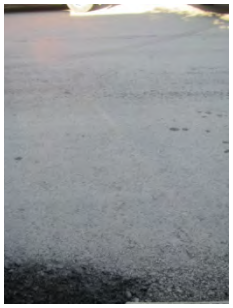
Figure 6.2-11 Photos of the Bridge on Kasymbekova St. (2/2)

d) The Bridge on Uch-Kocho St.

Bridge Name		The bridge on Uch-Kocho St.	Road Name	Uch-Kocho St.
Site Condition	Location	From the right bank side	Location	From the left bank side
				
	Location	From downstream of right bank	Location	From downstream of left bank
				
	Location	From upstream of right bank	Location	From upstream of left bank
				
	Location	Downstream direction	Location	Upstream direction
				

Source: JICA Survey Team

Figure 6.2-12 Photos of the Bridge on Uch-Kocho St. (1/2)

Bridge Name	The bridge on Uch-Kocho St.			Road Name	Uch-Kocho St.		
Damage photo	Component	Slab			Component	Girder		
	Damage	—	Level	a	Damage	Spalling	Level	c
	Condition	Good			Condition	Deterioration possibly due to poor construction		
								
	Component	Abutment			Component	Revetment		
	Damage	Spalling	Level	c	Damage	Deformation	Level	e
	Condition	Deterioration possibly due to poor construction			Condition	Possibility of damage to the abutment		
								
	Component	Bearing shoe			Component	Railing		
	Damage	Soil	Level	e	Damage	Damage	Level	c
	Condition	Soil surrounding shoe			Condition	Damaged sections		
								
	Component	Pavement and Joint			Component	Drainage facilities		
	Damage	—	Level	—	Damage	—	Level	—
	Condition	Pavement: good, Joint: cannot be found			Condition	None existent		
								

Source: JICA Survey Team

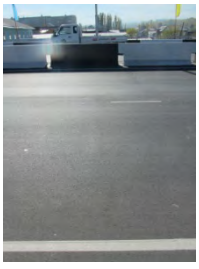
Figure 6.2-13 Photos of the Bridge on Uch-Kocho St. (2/2)

e) The Bridge on Navoi St.

Bridge Name		The bridge on Navoi St.	Road Name	Navoi St.
Site Condition	Location	From the right bank side	Location	From the left bank side
				
	Location	From downstream of right bank	Location	From downstream of left bank
				
	Location	From upstream of right bank	Location	From upstream of left bank
				
	Location	Downstream direction	Location	Upstream direction
				

Source: JICA Survey Team

Figure 6.2-14 Photos of the Bridge on Navoi St. (1/2)

Bridge Name	The bridge on Navoi St.			Road Name	Navoi St.		
Damage photo	Component	Slab			Component	Girder		
	Damage	—	Level	a	Damage	—	Level	a
	Condition	Good			Condition	Good		
								
	Component	Abutment and pier			Component	Revetment		
	Damage	—	Level	a	Damage	—	Level	—
	Condition	Good			Condition	Under construction		
								
	Component	Bearing shoe			Component	Railing		
	Damage	—	Level	a	Damage	—	Level	a
	Condition	Good			Condition	Good		
								
	Component	Pavement and Joint			Component	Drainage facilities		
	Damage	—	Level	c	Damage	—	Level	—
	Condition	Pavement: good Joint: There is a water leak			Condition	Under construction		
	 							

Source: JICA Survey Team

Figure 6.2-15 Photos of the Bridge on Navoi St. (2/2)

f) The Bridge on Abdukadirov St.

Bridge Name		The bridge on Abdukadirov St.	Road Name	Abdukadirov St.
Site Condition	Location	From the right bank side	Location	From the left bank side
				
	Location	From downstream of right bank	Location	From downstream of left bank
				
	Location	From upstream of right bank	Location	From upstream of left bank
				
	Location	Downstream direction	Location	Upstream direction
				

Source: JICA Survey Team

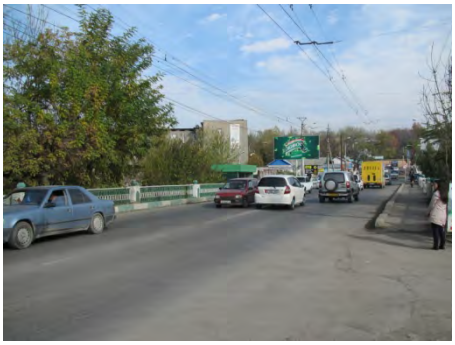
Figure 6.2-16 Photos of the Bridge on Abdukadirov St. (1/2)

Bridge Name		The bridge on Abdukadirov St.			Road Name	Abdukadirov St.		
Damage photo	Component	Slab			Component	Girder		
	Damage	Spalling Rebar exposure	Level	e	Damage	Spalling Rebar exposure	Level	d
	Condition	Much spalling and rebar exposure			Condition	Deterioration possibly due to poor construction		
								
	Component	Pier			Component	Pier		
	Damage	Spalling Rebar exposure	Level	e	Damage	Crack	Level	d
	Condition	Deterioration of pier head			Condition	Width of crack is more than 0.3mm		
								
	Component	Bearing shoe			Component	Railing		
	Damage	Soil	Level	e	Damage	—	Level	a
	Condition	Soil surrounding shoe			Condition	Good		
								
	Component	Pavement and Joint			Component	Drainage facilities		
	Damage	Crack	Level	e	Damage	—	Level	—
	Condition	Possibly cause by damage to the slab			Condition	None existent		
								

Source: JICA Survey Team

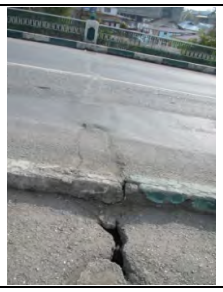
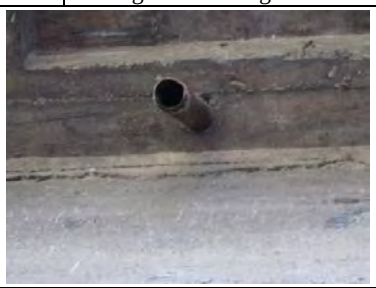
Figure 6.2-17 Photos of the Bridge on Abdukadirov St. (2/2)

g) The Bridge on Nurmatov St.

Bridge Name		The bridge on Nurmatov St.	Road Name	Nurmatov St.
Site Condition	Location	From the right bank side	Location	From the left bank side
				
	Location	From downstream of right bank	Location	From downstream of left bank
				
	Location	From upstream of right bank	Location	From upstream of left bank
				
	Location	Downstream direction	Location	Upstream direction
				

Source: JICA Survey Team

Figure 6.2-18 Photos of the Bridge on Nurmatov St. (1/2)

Bridge Name		The bridge on Nurmatov St.			Road Name	Nurmatov St.		
Damage photo	Component	Slab			Component	Girder		
	Damage	Spalling Rebar exposure	Level	e	Damage	Spalling Rebar exposure	Level	d
	Condition	Spalling and the rebar exposure in the overhang			Condition	Deterioration possibly due to poor construction		
								
	Component	Pier			Component	Revetment		
	Damage	Spalling	Level	c	Damage	Deformation	Level	e
	Condition	Aging degradation			Condition	Soil erosion		
								
	Component	Bearing shoe			Component	Railing		
	Damage	Stones & dirt	Level	e	Damage	Deformation	Level	c
	Condition	Stones & dirt surrounding shoes			Condition	Small deformation		
								
	Component	Pavement and Joint			Component	Drainage facilities		
	Damage	Pavement	Level	e	Damage	Blocked	Level	e
	Condition	Pavement: small crack Joint: cannot be found			Condition	Pavement overlay is preventing the drainage functioning		
								

Source: JICA Survey Team

Figure 6.2-19 Photos of the Bridge on Nurmatov St. (2/2)

CHAPTER 7 INFORMATION RELATED TO PROCUREMENT

7.1 Material/Equipment Procurement Environment

The survey team studied the environment surrounding the procurement of materials and equipment in and around Osh and found out that it is possible to procure most of the materials and equipment for this Project from construction companies in Osh. These companies have experience in road repair works in Osh and were serving as subcontractors in previous road and bridge projects assisted by donor agencies. Listed below are five major construction companies in Osh.

Table 7.1-1 Major Construction Companies (Osh)

Companies	Contacts	
Osh Ak Tash Company	Mr. Kasimaliev	TEL: 0559 226719
Cin Tash Company	Mr. Eshaliev	TEL: 0559 979297
DSU Company	Mr. Sulaimanov	TEL: 0551 717000
ABZ-RBU	Mr. Jutanov	TEL: 554 020220
JS Bolot	Mr. Mirlan	TEL: 0555 898763

Source: Study team

7.1.1 Material Procurement

Most of the materials required for road/bridge construction, including imported products, can be obtained in and around Osh, as well as from Bishkek. Cement and aggregates are produced in the outskirts of Osh. Gasoline, diesel fuel, bitumen, and other petroleum products are imported by train (tank cars) from Russia. Asphalt mixtures are produced in asphalt plants in and around Osh. Though rebars with diameters 19mm or less are also produced in Osh, their quality is unstable, as they use scraps as raw materials, and, therefore, are used mostly for building houses. Most of 19mm or larger diameter rebars as well as H-section steel posts and steel pipes that are sold in Osh are imported from Russia and Kazakhstan via Bishkek. Listed below are suppliers of main materials.

Table 7.1-2 List of Material Suppliers

Materials	Companies	Location	Supply Capacity	Unit Price* (USD/ton)
Concrete (Ready-mixed concrete) ($26N/mm^2$ equiv.)	Osh Ak Tash Company	Osh	320t/day	55.0
	Cin Tash Company	Osh	320t/day	55.0
	DSU Company	Osh	240t/ day	53.5
	ABZ-RBU	Osh	200t day	58.8
	JS Bolot	Osh	160t/ day	56.2
Ordinary Portland	Aravan Cement Plant	Aravan	1,000t/day	66.7
	Kizil Kiya Cement Plant	Kizil Kiya	2,500t/day	67.4
Asphalt mixture	Osh Ak Tash Company	Osh	500t/day	56.0

Materials	Companies	Location	Supply Capacity	Unit Price* (USD/ton)
(Dense grade 20 equiv.) (As6.5% around)	Cin Tash Company	Osh	320t/day	56.0
	DSU Company	Osh	300t/day	53.5
	ABZ-RBU	Osh	400t/day	55.0
	JS Bolot	Osh	350t/day	56.0
Bitumen	Osh Ak Tash Company	Osh	From Russia	496.0
	Cin Tash Company	Osh	From Russia	490.0
Asphalt emulsion	Osh Ak Tash Company	Osh	From Russia	505.0
	Cin Tash Company	Osh	From Russia	500.0
Fine, Coarse aggregate (Size 0-25mm equiv.)	Osh Ak Tash Company	Osh	320t/day	14.0
	Cin Tash Company	Osh	240t/day	17.0
	DSU Company	Osh	320t/day	14.0
	ABZ-RBU	Osh	280t/day	16.0
	JS Bolot	Osh	224t/day	15.0
Embankment material (Obtain from the suburbs of Osh) (Sandy soil with gravel)	Osh Ak Tash Company	Osh	Quarry	12.6
	Cin Tash Company	Osh	Quarry	14.0
	DSU Company	Osh	Quarry	11.0
	ABZ-RBU	Osh	Quarry	12.0
	JS Bolot	Osh	Quarry	15.0
Rebar (Size D32-35 equiv.)	Alay market	Osh	From Bishkek	463
	Alay market	Osh	From Bishkek	450
	Alay market	Osh	From Bishkek	492
H-section steel (Size H-200-300 equiv.)	Alay market	Osh	From Bishkek	635
	Alay market	Osh	From Bishkek	615
Oil – Gasoline	—	Osh	From Russia	0.51/L
Oil – Diesel	—	Osh	From Russia	0.55/L

Source: JICA Study team *Note: unit price includes transport cost.

7.1.2 Equipment Procurement

Construction companies located in Osh own the equipment needed for constructing roads and bridges. As it is the case with the materials described above, the five major construction companies possess various types of equipment needed for the work. 50-ton or larger cranes have been procured from Japan as part of previous grant aid projects for constructing bridges, as no such cranes were available in Kyrgyzstan. Listed below are owners of main equipment items.

Table 7.1-3 List of Existing Equipment

Equipment	Companies	Location	Holding No.	Unit Price* (USD/day)
Excavator (Weight 20ton)	Osh Ak Tash Company	Osh	6	525
	Cin Tash Company	Osh	4	540
	DSU Company	Osh	3	510
	ABZ-RBU	Osh	3	500
	JS Bolot	Osh	6	525

Equipment		Companies	Location	Holding No.	Unit Price* (USD/day)
Wheel Loader (Bucket 2-3m^3)		Osh Ak Tash Company	Osh	3	360
		Cin Tash Company	Osh	2	340
		DSU Company	Osh	1	370
		ABZ-RBU	Osh	1	360
		JS Bolot	Osh	1	355
Dump Truck (Loading 15-20ton)		Osh Ak Tash Company	Osh	10	315
		Cin Tash Company	Osh	6	320
		DSU Compan2013-2015y	Osh	4	330
		ABZ-RBU	Osh	6	345
		JS Bolot	Osh	2	335
Asphalt Paver (Width 3-7m)		Osh Ak Tash Company	Osh	1	1,200
		Cin Tash Company	Osh	2	1,275
		DSU Company	Osh	2	1,260
		ABZ-RBU	Osh	2	1,260
		JS Bolot	Osh	1	1,275
Road Roller (Weight 8-10ton)		Osh Ak Tash Company	Osh	2	370
		Cin Tash Company	Osh	1	375
		DSU Company	Osh	2	385
		ABZ-RBU	Osh	1	375
		JS Bolot	Osh	2	390
Crane	(55ton)	Most Group Company	Bishkek	1	920
	(60ton)			1	1,200

Source: JICA Study team *Note: Unit price includes operator, driver, and fuel costs.

7.2 Transportation and Customs Clearance

7.2.1 Transport Routes

Most materials such as petroleum and steel products are imported from Russia, while some steel products are imported from Kazakhstan. Petroleum products are carried by train from Russia to Osh, while steel products are transported from Russia by train to Osh or Bishkek and, in the case of the latter, from Bishkek to Osh by truck.

Construction equipment and materials procured in Japan will be loaded at and shipped from Yokohama, Kobe, and/or Moji Port and transported on the Trans-Siberian or the Chinese Railway to Kyrgyzstan via Kazakhstan. Using the Chinese Railway will require transshipment of cargo, which takes a few days, at the China-Kazakhstan border due to a difference in rail gauge. For this reason, the Chinese route is usually used to transport small equipment and materials that can be packaged in easy-to-transship freight containers while the Trans-Siberian Railway is a common choice for transporting large items to prevent damage and theft, which often occurs during transshipment. Truck transport from Bishkek to Osh should be avoided during winter season as much as possible, as the route goes through the Tuu Ashu pass (3,586m) and the Ala Bel pass (3,184m) on the Bishkek-Osh Road.

Transporting goods to the cargo terminal in Osh through the Uzbekistan-Tajikistan-Uzbekistan route from Kazakhstan is a possible option. However, this route has never been used in past projects, as it would take a longer time to pass through the borders, the longer rail transport distance and because it requires a representative of the consignee to go to the Osh customs office to attend customs clearance.

Another option is to ship the goods from a Japanese port by the ocean to the Port of Bandar Abbas in Iran, where cargo is unloaded and then transported by truck directly to Osh via Turkmenistan and Uzbekistan. While this route allows through transit without requiring transshipment, it will take a longer ocean freight distance and time and a higher cost than the above rail transport options.

Japanese trading companies have not been using the Iranian route to ship equipment and materials to Kyrgyzstan, partly due to the economic sanctions Japan has been imposing against Iran since 2007 in connection with Iran's nuclear development issue. However, this route will become a viable option upon lifting of the economic sanctions, which will likely occur in the near future.

The route and time of each transport option are shown in the table below.

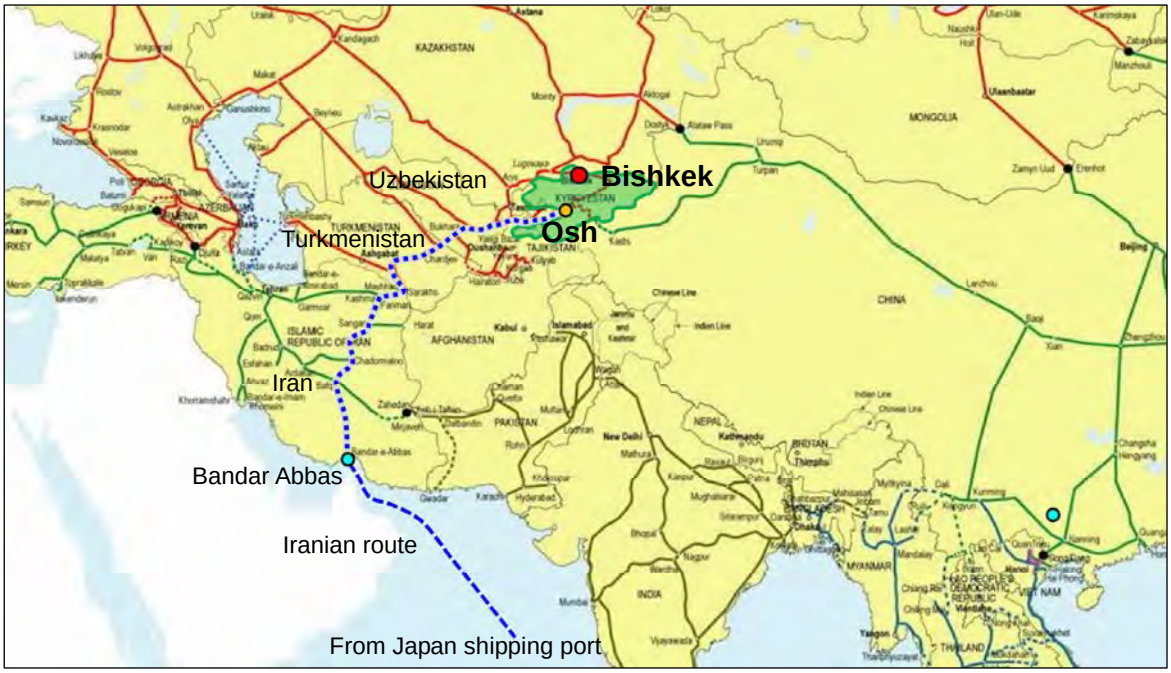
Table 7.2-1 Transport Routes and Time

Routes	Ship / Cargo	Transport Pathway	Period
Siberian Railway	Conventional ship/ Heavy equipment	Japan shipping port → (Ocean) → Nakhodka → (Rail) → Bishkek → (Truck) → Osh	40-50days
Chinese Railway	Container ship/ Small equipment	Japan shipping port → (Ocean) → Lianyungang → (Rail) → Border with Kazakhstan (Transshipment) → Bishkek → (Truck) → Osh	30-35days
Iran	Conventional and Container ship/ Heavy and Small equipment	Japan shipping port → (Ocean) → Bandar Abbas → (Truck) → Osh	60days

Source: JICA Study team

Source: JICA Study Team

Figure 7.2-1 Transportation Routes (1)



Source: JICA Study Team

Figure 7.2-2 Transportation Route (2)

7.2.2 Customs Clearance

In order to clear the customs for equipment and materials imported for Japanese grant aid projects, the following documents need to be submitted to the relevant customs office prior to the arrival of each shipment to obtain a tax exemption certificate: (i) copies of contracts related to the project and (ii) original invoice, packing list, certificate of origin, and insurance policy for each shipment. Though it usually takes about two weeks to obtain the tax exemption certificate, obtainment of such certificate in advance will make it possible to clear the customs usually in one day and receive the goods immediately thereafter.

The import declaration and customs clearance procedures need to be attended by a representative of the consignee of the goods, who, in this case, is the Minister of the implementing agency of the Project, carrying a written power of attorney from the Minister. In order to ensure a smooth arrival of the goods, Japanese trading companies should prepare and deliver all necessary documents without omission, and local freight companies should preferably follow up on the customs procedure.

7.3 Construction Cost

7.3.1 Unit Price of Construction Work

Listed below are unit prices for works related to road/bridge construction.

Table 7.3-1 Unit Price of Construction Works

Materials	Companies	Construction Capability/day	Unit Price* (USD/)
Paving works (As 5cm×2layers×3.5m width)	Osh Ak Tash Company	1,500m	320/m
	Cin Tash Company	1,200m	350/m
	DSU Company	1,300m	315/m
	ABZ-RBU	1,600m	300/m
	JS Bolot	1,500m	300/m
Subgrade works (Thickness 20cm)	Osh Ak Tash Company	1,000m	70/m
	Cin Tash Company	800m	77/m
	DSU Company	800m	75/m
	ABZ-RBU	500m	72/m
	JS Bolot	500m	70/m
Existing pavement removal (As 10cm, Subgrade 20cm×3.5m)	Osh Ak Tash Company	900m	28/m
	Cin Tash Company	800m	25/m
	DSU Company	700m	29/m
	ABZ-RBU	500m	22/m
	JS Bolot	500m	26/m
Earth works / slop cut (Sand soil – Soft rock)	Osh Ak Tash Company	1,000m^3	25/m^3
	Cin Tash Company	500m^3	22/m^3
	DSU Company	500m^3	26/m^3
	ABZ-RBU	400m^3	20/m^3
	JS Bolot	600m^3	28/m^3
Earth works / embankment with compaction	Osh Ak Tash Company	1,500m^3	29/m^3
	Cin Tash Company	1,000m^3	28/m^3
	DSU Company	1,300m^3	26/m^3
	ABZ-RBU	1,000m^3	29/m^3
	JS Bolot	900m^3	30/m^3
Road marking (Width 10-15cm)	CMEU (Osh)	1,500m	20/m
	RM Service (Bishkek)	2,000m	19/m
	Most Group Company (Bishkek)	2,000m	19/m
Rebar works	Osh Ak Tash Company	1.0ton	1,250/ton
	Cin Tash Company	0.8ton	1,200/ton
	DSU Company	1.0ton	1,300/ton
Formworks (Reinforced concrete)	Osh Ak Tash Company	50m^2	30/m^2
	Cin Tash Company	30m^2	33/m^2
Concrete works (Reinforced concrete)	Osh Ak Tash Company	100m^3	85/m^3
	Cin Tash Company	80m^3	80/m^3

Source: JICA Study Team *Note: Unit prices include costs of equipment and materials.

7.3.2 Unit Price of Labors

Listed below are unit prices for labors related to road/bridge construction works.

Table 7.3-2 Unit Price of Labor

Labors	Companies	Enrollment	Unit Price (USD/man･day)
Foreman	Osh Ak Tash Company	7	68
	Cin Tash Company	6	75
	DSU Company	8	80
	ABZ-RBU	10	82
	JS Bolot	7	80
Skilled labor	Osh Ak Tash Company	20	25
	Cin Tash Company	15	28
	DSU Company	28	24
	ABZ-RBU	30	23
	JS Bolot	18	20
Common labor	Osh Ak Tash Company	35	25
	Cin Tash Company	30	20
	DSU Company	28	18
	ABZ-RBU	27	22
	JS Bolot	30	19
Equipment operator	Osh Ak Tash Company	12	50
	Cin Tash Company	10	45
	DSU Company	8	50
	ABZ-RBU	9	44
	JS Bolot	10	39
Dump truck driver	Osh Ak Tash Company	12	30
	Cin Tash Company	7	42
	DSU Company	4	50
	ABZ-RBU	6	40
	JS Bolot	3	30

Source: JICA Study Team

7.3.3 Costs of Donor Projects

Table 7.3-3 shows a list of major road rehabilitation projects that have been implemented since the late 1990s with the assistance of donor agencies such as ADB, JICA (including JBIC), WB, Export-Import Bank of China (Exim Bank of China), and Islamic Development Bank (IsDB). Prime contractors of these projects are the China Road and Bridge Corporation (CRBC), as well as general contractors of Turkey, Iran, and other Islamic countries.

Table 7.3-3 Road Projects Assisted by Donor Agencies

Road Improvement Projects		Donors	Distance Post (KM-KM)	Length (km)	Lane (one-side)	Companies /Countries	Project Cost (1000 USD) / Unit Cost/km (1000 USD)	Construction Period (Year)	No. of Bridge / Total Length (No./m)
BO Road	Phase1	ADB	412-426	14	1	Entes/Turky	47,100.0 466.4	1996-2001	-
			161-248	87	1			1996-2001	-
		JBIC (JICA)	325-362	37	1	Suusamy-Inter JV, Keyson Construction/Iran	20,800.0 562.2	1997-2001	-
	Phase2	ADB	61-161	100	1	Samsung Const -ruction/Korea	70,500.0 705.0	1998-2005	-
		JBIC (JICA)	248-325	127	1	Entes Indust'l Plant Const. &Erection Constracting Co.,Inc./Turky	40,500.0 318.9	1998-2005	- -
			362-412		1				
	Phase3	ADB	426-498	72	1	Entes/Turky	45,880.0 374.5	2001-2007	-
			614-664.5	50.5	1				-
	Phase4	ADB	8.5-61	43.5 9	2 3	-	90,000.0 1,714.3	Plan	6/6-24
		EBRD	500-573	73	1	-	60,000.0 821.9	Plan	-
OSI Road		ADB	3-80	77	1	CRBC/China	45,000.0 584.4	2005-2010	9/184
		IsDB	80-123	43	1	CRBC/China	19,800.0 460.5	2005-2011	9/399
		Exim Bank of China	123-190	67	1	Beicin Road /China	75,300.0 1123.9	2005-2012	8/110
		China State Bank	190-240	50	1		25,300.0 506.0	2005-2011	2/24
		China Devl. Bank	240-258	18	1		7,200.0 400.0	2005-2007	-
Osh Ring Road		WB	0-9.75	9.75	1	CRBC/China	4,000.7 410.3	2011-2012	-
OBI Road		WB	10-28	18	1	Sintzyan Beisin Road & Bridge /China	16,000.0 888.9	2013- under construction	-
		JICA	28-75	47	1	-	-	Plan	-
		EC	108-123	15	1	CRBC/China	9,240.0 616.0	2012- under construction	-
		WB	123-155	32	1	Sintzyan Beisin Road & Bridge /China	24,960.0 780.0	2010-2012	-
		EBRD	155-220	65	1	Sintzyan Beisin Road & Bridge /China	35,000.0 538.5	2009-2012	-

Road Improvement Projects	Donors	Distance Post (KM-KM)	Length (km)	Lane (one-side)	Companies /Countries	Project Cost (1000 USD) / Unit Cost/km (1000 USD)	Construction Period (Year)	No. of Bridge / Total Length (No./m)
	Exim Bank of China	220-232	12	1	CRBC/China	9,630.0 802.5	2013-under construction	-
	EC	248-271 Bypass	23	1	East-European Alliance/Ukraine	6,770.0 294.3	2010-2012	-
	Exim Bank of China	248-271 Existing	23	1	CRBC/China	4,520.0 196.5	2013-under construction	
	Exim Bank of China	271-360	89	1	CRBC/China	77,280.0 868.3	2013-under construction	
Sary Tash -Irkeshtam Road	ADB	0-136	136	1	CRBC/China	48,600.0 357.4	2008-2012	-
Taraz -Talas -Suusamyr-Road	IsDB	0-52	52	1	Kayaogh Yortash /Turky	13,700.0 263.5	2006-2009	3/83
		52-75	23	1		12,700.0 552.2	2009-2011	2/30
	IsDB, Saudi Devel. Bank	75-101	26	1	Cakir Yapi /Turky	23,000.0 884.6	2015-under construction	-
BNT Road	Exim Bank of China	9-272	263	1 2	CRBC/China	200,000.0 760.5	2009-2014	20/562
	Arabic Coordination Group	272-365	93	1 2	Kopri&Cinohydro /China,Kuveit	72,350.0 778.0	2013-	1/24
	ADB	365-539	174	1	CRBC/China	155,500.0 893.7	2009-under construction	-

Source: JICA Study Team based on MOTC Information

Among the above one-lane (in each direction) road projects, the unit price (USD/km) tends to be higher for road sections that require a lot of cut and fill works in the mountainous areas, as well as for those that have a long bridge length. This is because such sections incur additional costs for earthworks and bridge construction, unlike those that only require re-pavement works. Among sections under similar construction conditions, more recently constructed sections tend to have higher unit prices due to price inflation and other factors.

Table 7.3-4 shows a list of major bridge reconstruction/construction projects assisted by donor agencies. Bridges reconstructed by Japan were through grant aid, as well as the bridges reconstructed by Russian grant aid in Osh City.

Table 7.3-4 Bridge Projects Assisted by Donor Agencies

Bridge Construction Projects	Donors	Length (m)	Span	Lane (one-side)	Beam Structure	Companies /Countries	Project Cost (1000 USD) / Unit Cost/m² (1000 USD)	Construction Period (Year)
Chui Oblast (BNT road)						Iwata Chizaki /Japan	5,800.0 / 4.9	2009-2011
Alamedin St. Bridge	JICA	42.0	3	1	PC			
Ala-Archa St. Bridge		28.0	1	1	PC			
Keng-Burun St. Bridge		23.4	1	1	PC			
Kugart River (BO road)						Iwata Chizaki /Japan	11,184.0 / 9.8	2013-2015
Kugart River Bridge	JICA	89.0	3	1	PC			
Osh city road								
Navoi St. Bridge	Govt. of Russia	264	18	2	RC	Mostootriad UKJD, Safary Ltd / Kyrgyzstan	13,000.0 / 2.5	2013-2015
Ozgur village Bridge	Govt. of Russia	36	2	2	RC	-	1,600.0 / 2.2	Plan

Source: JICA Study Team based on MOTC Information

The structural difference between bridges constructed by Japan and those by Russia is that the former use pre-stressed concrete (PC) girders whereas the latter use reinforced concrete (RC). PC girders are generally more resilient to stress thus allowing longer spans than RC girders. Japanese projects employed PC girders with longer spans and fewer supports in order to obstruct the river flow as little as possible.

7.4 Eurasian Economic Union

On August 12, 2015, the Treaty on the Accession of the Kyrgyz Republic to the Treaty on the Eurasian Economic Union (the EEU) came into force, and Kyrgyzstan became a full-fledged member of EEU along with Armenia, Belarus, Kazakhstan, and Russia. EEU was built on the foundation of a customs union between Russia, Belarus, and Kazakhstan with the goal of creating an integrated single market by eliminating intra-bloc tariffs and allowing free movement of goods imported from third countries while establishing a common external tariff policy. The member states also apply common standards to regulate the quality and performance of equipment and materials and to control food safety, etc.

As a result, of Kyrgyzstan's accession to EEU, goods (petroleum and steel products, etc.) imported from within EEU will be duty-free. On the other hand, higher tariffs than before the accession will be imposed on most equipment and materials imported from outside EEU.

7.5 Risks Associated with Procurement

No major problems are anticipated with regard to the quantity and quality of the equipment and materials, as well as the skill levels of workers, to be procured for the construction of the roads and bridges. Potential risks associated with procurement lie in the transportation of goods.

As described in "7.2 Transportation and Customs Clearance," large equipment and materials, except those packaged in freight containers, will be transported without encasement (bare cargo) and are thus susceptible to damage and theft. Accordingly, such goods not only need to be insured, but should also be securely packaged and protected when loaded onto a ship by, for example, removing theft-prone components (batteries, lamps, mirrors, tools, etc.) and putting them in lockable storage space in each equipment unit. The risk of damage and theft is especially high on the Chinese Railway route, as transshipment will take place at the Kazakh border. Damage to the front window of a wheel loader and theft of components of other road maintenance equipment and vehicles has occurred on this route in past grant aid projects. For this reason, use of the Chinese Railway route for transporting large equipment and materials should be avoided as much as possible.

Truck transport from Bishkek to Osh will go through passes at over 3,000m elevations on the Bishkek-Osh Road Oblast, where accidents occur frequently due to snow avalanches and frozen road surface during winter, increasing the risk of traffic obstruction. Accordingly, the use of this highway during winter should be avoided as much as possible.

As a result, of Kyrgyzstan's accession to EEU, tariffs on goods imported from outside the region will be higher. Although this does not affect the equipment and materials that will be exempt from taxation under the grant aid system, other equipment and materials that are taxable will be affected and thus need to be paid attention to. Taxable equipment and materials also need to conform to the unified EEU standards. If conformity certificates are required for such items, they need to be obtained in advance.

CHAPTER 8 ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

8.1 Regulatory Framework and Procedure of EIA

8.1.1 Regulatory Framework of EIA

The major environmental laws and legislations of the Kyrgyz Republic are shown in Table 8.1-1.

Table 8.1-1 Major Legislations for the Environmental Protection

Legislation	Year Passed (Revised)	Purpose / Content
Constitution of the Kyrgyz Republic	2010	Land, subsoil, air waters, forest, wildlife and other natural resources shall be utilized and, at the same time, protection shall be given.
Law on Environmental Protection	1999 (2002, 2003, 2004, 2005, 2009)	The general legal framework for environmental protection and their use. This law regulates the relations between rights and responsibilities of public organizations and various agencies of the state.
Law on Specially Protected Area and Biosphere Territory	1999	To regulate relations in the organization, protection and use of protected areas.
Law on the Protection of Ambient Air	1999 (2003, 2005)	Ambient air standard and air quality management.
Law on waters	1994 (1995)	To regulate the use and protection of waters, and preventing environmentally harmful effects.
Forest Code	1999	The legal basis for the rational use, protection and reproduction of forests.
Law on the Radioactive Safety of the Population	1999	The legal relationship in the field of radiation safety and protection of the environment from the harmful effects of radiation sources.
Law on Ecological Expertise	1999 (2003, 2007)	About the legal relations in the field of environmental impact assessment.
Law on Wildlife	2002 (2003)	About protection of wildlife habitats.
Law on Fisheries	1997	To regulate legal, economic and organizational basis of fisheries.
Law on Subsoil	1997	To regulate relations arising from the use of mineral resources.
Law on Protection and Use of Flora	2001 (2003, 2007)	About protection, use, and reproduction of flora.
Law on Mountain Areas in the Kyrgyz Republic	2002 (2003)	To create socio-economic and legal framework for the sustainable development of mountain areas.
Law on Waste of Production and Consumption	2001	About waste management.

Source: Web Site of "State Agency on Environment Protection and Forestry" (http://www.nature.kg/)

Regarding EIA, the Kyrgyz Government stipulates related legislations including the Law of Environmental Protection. The EIAs in Kyrgyz are carried out under these related legislations.

1) Law on Environmental Protection

This law is the most basic law on environmental protection in Kyrgyz. Section IV provides environmental requirements for economic and other activities. The Article16 of this section describes that implementation of a project which may affect environment requires environmental impact assessment (EIA);

2) Law on Environmental Impact Assessment

This law provides whole matters on EIA of Kyrgyz Republic.

The Section I describes objectives, principles of EIA and that State environmental assessment and Public ecological expertise should be implemented in EIA.

The Section II stipulates the power, rights and duties of the specially authorized state body on EIA, including demarcation of local state administrations and local authorities.

3) Law on General Technical Regulation on Environmental Safety

The Appendix 1 of the Law lists 23 economic activities subject to mandatory EIA. According to the lists, construction of roads and railways is a subject of EIA.

4) Instructions on the Procedure for Assessing the Impact of the Proposed Activity on the Environment (EIA)

The instructions provide tangible procedures of the EIA including scope, organization, participants and steps. The Annex 2 shows the list of activities subject to the EIA and Appendix 3 shows the list of actives excluded from the EIA.

8.1.2 Projects which Require an EIA

Projects, which requires the EIA procedure are listed in the Appendix 1 of *the law on General Technical Regulation on Environmental Safety and the Annex 2 of the instruction on the Procedure for Assessing the Impact of the Proposed Activity on the Environment (EIA).* Twenty-three projects are designated as environmentally affecting projects. The “Construction of road and railway” is included in the list. (see Table 8.1-2.)

Table 8.1-2 The List of Activities Subject to EIA

1. Energy facilities	14. Facilities for wastewater treatment, flue gas
2. Reservoirs	15. Intakes of groundwater
3. Enterprises for extraction and processing of oil, oil products, and gas	16. System of water supply of populated areas, irrigation, and drainage systems
4. Production of building materials (cement, asphalt, slate, asbestos cement pipes, etc.)	**17. Construction of roads and railways**
5. Agriculture and forestry	18. Airports, landfills for test ports for inland navigation, racing tracks
6. Mines	19. Construction of facilities for recreation and tourist destination
7. Metal industry	20. Industrial centers
8. Production of glass	21. Sewer network
10. Chemical production	22. Mountain lifts and cable cars
11. Food industry	23. Recycling and disposal of industrial and domestic waste
12. Textile, leather, paper industry	
13. Warehouses for toxic, hazardous and radioactive substances	

Source: Annex 2 of the instruction on the Procedure for Assessing the Impact of the Proposed Activity on the Environment (EIA)

On the other hand, activities excluded from EIA are listed in the Appendix 3 of *the instruction on the Procedure for Assessing the Impact of the Proposed Activity on the Environment (EIA)*. The activities excluded from EIA are the followings:

1. Current repair;
2. Work on the internal renovation of building;
3. Small-scale construction that is being passed from the previous estimate of the master plan;
4. Inventory and plans for monitoring of the environment;
5. Research and development which does not cause any environmental consequences or danger;
6. Purchases that do not require action by the authorities, negatively affecting the environment;
7. Construction of residential buildings, community facilities, utilities that own no harmful effects on the environment (connected to a centralized source of heat, water, sewage network).

Although categories requiring the EIA are defined, project scales which require the EIA are not specified in the laws and regulations.

8.1.3 Procedure of EIA

According to the Instruction on the Procedure for Assessing the Impact of the Proposed Activity on the Environment (EIA) above mentioned, an EIA procedure is conducted, including the following 5 stage:

Stage 1: Notice of Intent (Declaration of Intent)

The purpose of this stage is to inform the public about the proposed activity in the area. The project initiator declares the contents, including in particular:

Aims and objectives of the implementation plan and

basic characteristics of the proposed activity including environmental problems and feasible alternatives.

The notice of intent is conducted as a stakeholder meeting, including the project initiator, local government, and other stakeholders. The results of the meeting are informed to the public by the press.

Stage 2: Determination of the Impact on the Environment

This stage includes conducting a survey and analysis to compile an EIA document. Wide range information from the environment to socio-economics and cost-benefit analysis should be collected as a baseline. Based on the information and characteristics of the project, the impacts of the project are determined. This stage competes the preparation and execution of an environmental impact statement (EIS).

Stage 3: Identifying the environmental impacts

This stage is public hearings of the EIS. The public hearings are organized by the project initiator. The public hearings and discussions (depending on the significance of the project) are conducted on national and/or local levels. On the public hearings the following points should be clarified:

Identifying and fixing of all possible adverse environmental effects of the project;

The search for mutually acceptable solutions to all public positions on the prevention or reduction of negative impacts;

Informing stakeholders about the merits and demerits of the project

The results of the public hearings are documented and are referred to for making possible adjustments of the project.

Stage 4: Adjustments of the Project

This stage is the prediction of the environmental changes due to the project implementation. These environmental changes include the atmosphere, land, surface water and groundwater, hydrogeological, hydrological, geological, seismic, and other conditions. According to the results of the forecast, additional mitigation measures are examined.

Stage 5: Environmental Statement

This stage consists of the preparation of an Environmental Statement (ES). The ES is a document, in which the results of EIA are compiled in. The ES contains the following:

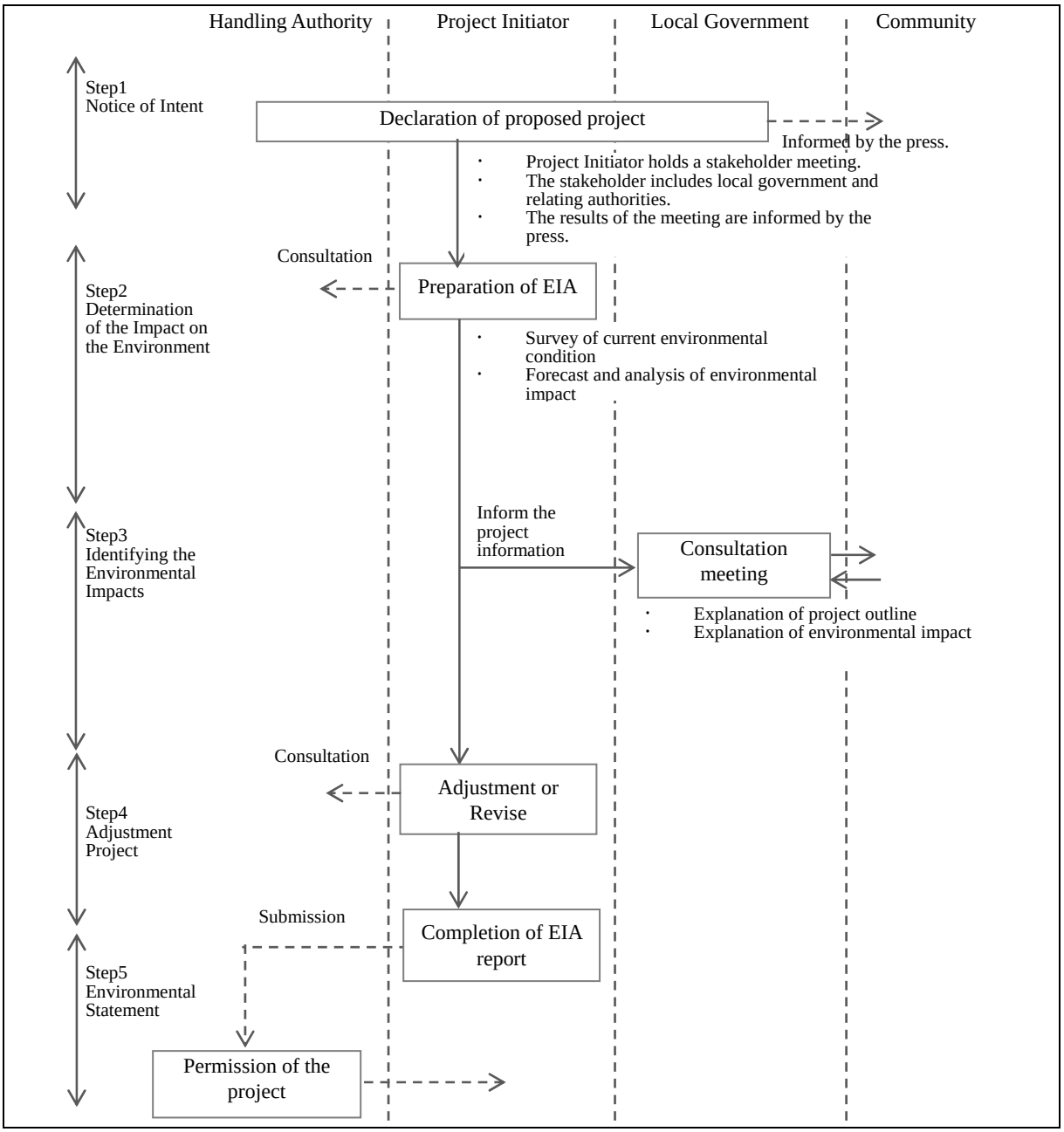
The main results of studies conducted in the EIA process and their conclusions;

Significant effects on the environment and effects on human health and the conditions of life;

Commitments and guarantees of the project to ensure environmental safety for the entire period of the company

The flow of the EIA procedure is shown in Figure 8.1-1.

A required term for EIA highly depends on the survey and preparation of an EIA report, which the project initiator conducts. An audit term for EIA reports (from the submission of the EIA report until the permission of the project) is approximately one month.



Prepared by JICA Survey team according to the *Instruction on the Procedure for assessing the Impact of the Proposed Activity on the Environment (EIA) in the Kyrgyz Republic and interview to the State Agency on Environment Protection and Forestry*

Figure 8.1-1 Flow of EIA Procedure

8.1.4 Participants and Roles

Participants in the implementation of the EIA are: project initiator, EIA developer, authorities, and the public. The participants and their obligations are shown in Table 8.1-3.

Table 8.1-3 The Participants in the Implementation of the EIA and Obligations

Participants	Obligations
Project initiator	・ To shoulder EIA costs ・ To organize the EIA ・ To carry out public hearing on the proposed project ・ To acquire necessary permission, organize relationships with the state authorities as well as the media
EIA developer (Licensed Consultant)	・ To ensure compliance with all EIA procedures ・ To ensure the accuracy, completeness or quality of the results of the EIA ・ To prepare the EIA documents
Authorities	・ To participate in the examination of the EIA ・ To issue (agree) reasonable environmental conditions and requirements for the implementation of the project ・ To decide on the feasibility of the project according to the developed and coordinated EIA
Public	・ To review the EIA materials for a specific project in a specific area ・ To prepare a report and recommendations on the issue

Source: Instruction on the Procedure for assessing the Impact of the Proposed Activity on the Environment (EIA) in the Kyrgyz Republic

8.2 Land Acquisition and Involuntary Resettlement

8.2.1 Laws and Legislations on the Land Acquisition and Involuntary Resettlement

Laws and legislations of the land acquisition and involuntary resettlement and the outlines are shown in Table 8.2-1.

Table 8.2-1 Major Legislations for the Land Acquisition and Involuntary Resettlement

Legislation	Year Passed	Purpose / Content
Constitution of Kyrgyz Republic	2010	The Article 12 provides that: diversity of ownership forms and equal legal protection to ownerships; various types of ownership; and acquisition of property for public purposes with fair and prior payment of the compensation.
Land Code	1999 (2012)	The code provides that land can be acquired for state and purposes based on an agreement between the authorized body and landowner or land user, and compensation should reflect the market value of the right to the land and losses; land owners/users can be allocated replacement land with the same value.
Civil Code	1996 (2013)	The code provides types and costs of losses that must be compensated in the case of land acquisition and involuntary resettlement.
Law on Grievances	2007 (2011)	The law provides that the grievance from the Kyrgyz Republic citizens should be registered, given due consideration, and adjusted in an equitable, timely and accountable manner.
Law on Roads	1998 (2011)	The law provides that roads of common use can be only in state ownership and cannot be sold or held in private ownership. The following activities are prohibited on the right-of-way of common use roads: organizing trading outlets along the roads; and buildings, kiosks, pavilions and similar structures.

Legislation	Year Passed	Purpose / Content
Regulation on Assets Valuation	2003 (2006)	The valuation of the assets is carried out on the basis of the temporary rules for the valuators and valuation companies, valuation standards for the valuators and other provisions of national legislation.

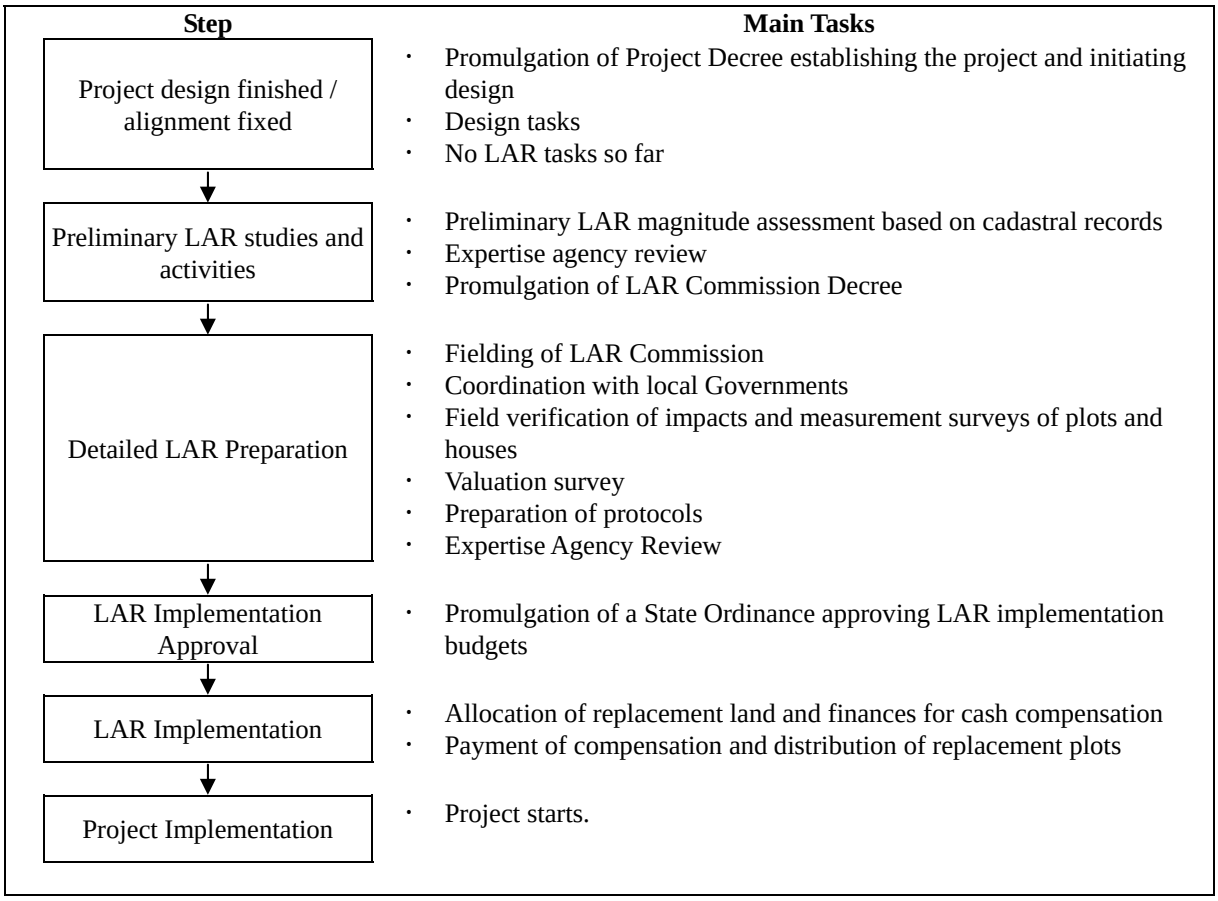
Source: JICA Survey Team

8.2.2 Outlines and Procedure of Land Acquisition and Involuntary Resettlement

The land acquisition for the public purposes is ensured under the Constitution. Simultaneously with it, fair and prior payment of compensation is also guaranteed. The land acquisition is conducted under the agreement with the authority and landowner (user). The price of the compensation is valuated based on the market price. Furthermore the exchange of equivalent land is also adopted as a measure of compensation. Valuation of assets is conducted by independent valuators.

On the other hand, there is no policy and no legislation on full replacement cost, the preparation of a resettlement action plan, livelihood rehabilitation, and information disclosure.

Land acquisition and resettlement (LAR) in the Kyrgyz Republic is carried out as shown in the figure below: Figure 8.2-1.



Source: Country Assessment on Land Acquisition and Resettlement, 2013, ADB

Figure 8.2-1 Process of Land Acquisition and Resettlement (LAR) in the Kyrgyz Republic

The process of land acquisition and resettlement starts after the completion of project design and the fixing of alignments. After the promulgation of the Project Decree, establishing the project and initial design, preliminarily the magnitude of land acquisition and resettlement is evaluated based on cadastral records. After the promulgation of LAR Commission Decree, detailed LAR preparations are proceeding. On this stage, field verification of impacts and measurement surveys of plots and houses are carried out. As a parallel activity, the valuation of properties is surveyed. These tasks are conducted under the LAR Commission and coordination with the local Government. Based on the results of the LAR survey, the budget for the implementation of LAR is approved. After that (before the implementation of the project), the allocation of replacement land and finances for cash compensation are conducted.

8.3 Evaluation of the Proposed Projects on the View of Environmental and Social Considerations

The proposed projects may affect surrounding environment and cause involuntary resettlement. Based on the proposed projects, the Survey team carried out a field reconnaissance and examined the evaluation on the view of environmental and social considerations.

1) Replacement of Nurmatov St. Bridge

The current conditions of the vicinity of Nurmatov St. Bridge are shown in Figure8.3-1.

Source: JICA Survey Team

Figure 8.3-1 Current Conditions of the Vicinity of Nurmatov St. Bridge

Since the vicinity of Nurmatov St. Bridge is an urban district, which has been developed, the proposed project does not cause significant negative impacts. On the other hand, since the expansion of the bridge accompanies the expansion of both approach roads, land acquisition is required on the downstream side. The subjects of land acquisition are: the park; the restaurant in the park; 4 shops or restaurants. Therefore, the project may cause tens project affected persons (PAPs). Because the buildings, including restaurants and shops are commercial facility and it seem to be uninhabited, the implementation of the project may not cause resettlements which accompany moving houses or living bases. Regarding the negative impact on the park, some trees are planted and a stream is running. Since these are forced to be demolished, suitable measures of the consultant together with the handling sections of Osh city are

required[1]. (Regarding land acquisition, the opinions of the Road Management Department are shown in 9.9.1 (1).)

Because the proposed project corresponds to "construction of roads and railways" which requires EIA in the Kyrgyz Republic, the project initiator must carry out the EIA procedure as a next step (feasibility study stage)[2].

Outlines and issues of the proposed project in the views of the environmental and social considerations are shown on Table 8.3-1.

Table 8.3-1 Outlines and Issues of the Proposed Project on the View of the Environmental and Social Considerations (Replacement of Nurmatov St. Bridge)

	Outlines	Issues and requirement on next step
Environment	・ The vicinity is an urban district, which has been developed. Therefore, the proposed project may not cause significant negative impacts.	・ The trees and stream in the park are affected. Permission or agreement is required after consultation with the handling sections of Osh city or other agencies. ・ The project requires an EIA procedure in the Kyrgyz Republic in the next step (F/S stage).
Social (Resettlement)	・ The expansion of both approach roads requires land acquisition on the downstream side. (On the land of the upstream side there is a gas station within an affected area. The demolition of the gas station may affect the environment.) ・ The subjects of land acquisition are: the park; the restaurant in the park; 4 shops or restaurants. ・ The project may cause some tens of project affected persons (PAPs). However physical resettlements may not be caused.	・ The proposed project may cause small scale involuntary resettlement. Therefore, an abbreviated Resettlement Action Plan (aRAP) has to be prepared for next step.
On the Category of JICA Guidelines The proposed project has no significant negative impacts on the environment. It is estimated that the number of PAPs is estimated to be below 200. Therefore, the JICA Guideline's category of the project is estimated Category B.		

Source: JICA Survey Team

2) South Bypass Road of Osh City

The vicinity of the proposed project is a mainly rural area which has not been developed yet. The proposed project is carried out in the area of the existing road as well as new constructions

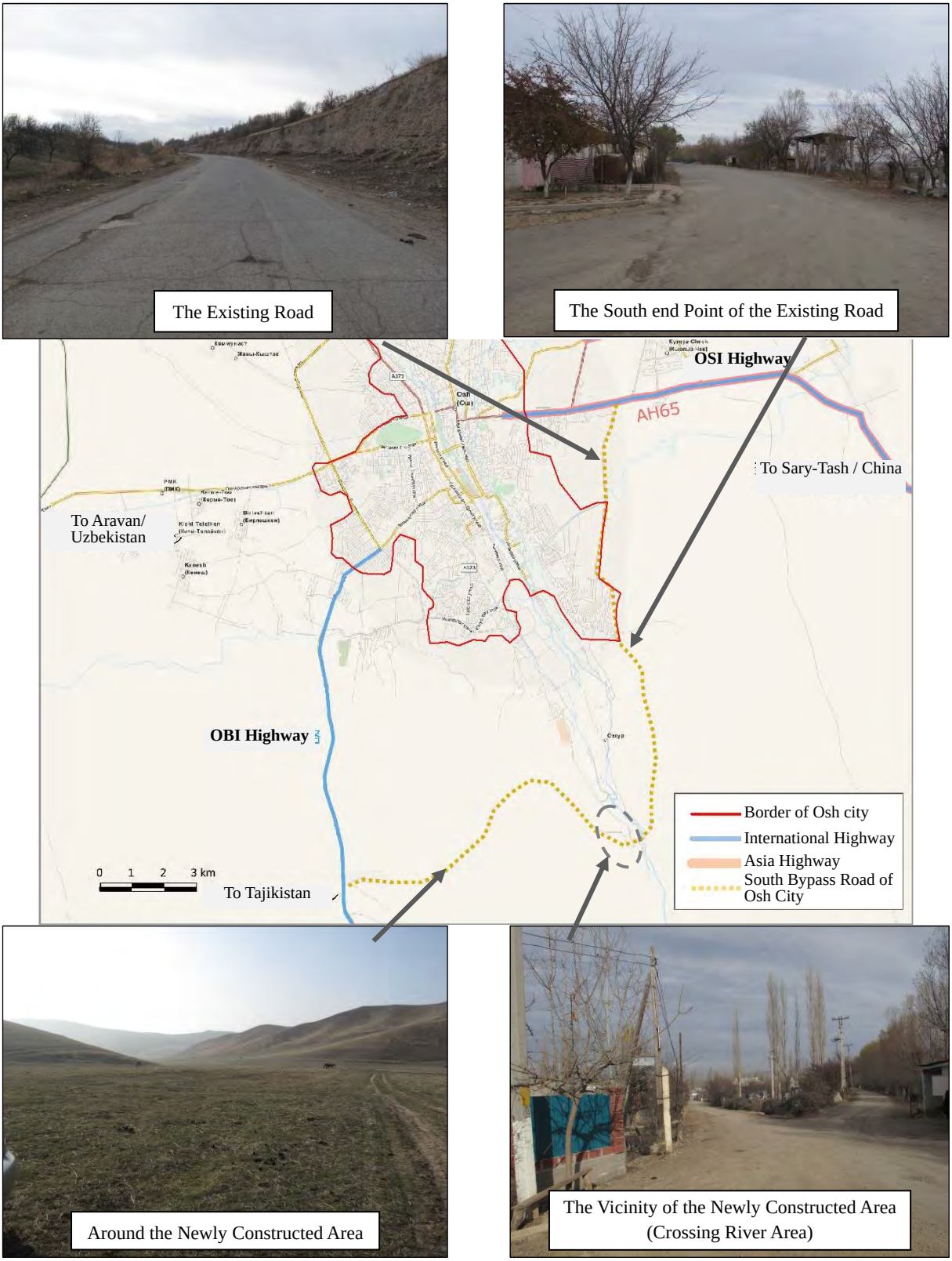
1 The Survey team consulted with the environmental and architecture sections of Osh city. They mentioned that it is easy to obtain permit on demolition of the trees and others.

2 The proposed project is a "bridge construction". A staff of the State Agency on Environment Protection and Forestry mentioned that the project requires an EIA procedure.

in a greenfield area. The area of the existing road keeps enough road width for a two lanes road. (See Figure 8.3-2, upper of left and upper of right.) Therefore, it is estimated that no land acquisition is required and negative impacts on the environment are few.

On the other hand, most of the newly constructed areas are undeveloped steppes. (See Figure 8.3-2, lower of right.) Since negative impacts on the environment are unclear as of now, a detail environmental survey needs to be conducted as the next step. There is a settlement around the river crossing point. The settlement will be affected, and some households may be forced to involuntary resettlement. (See Figure 8.3-2, lower of right)

Because the proposed project corresponds to “construction of roads and railways” which requires EIA in the Kyrgyz Republic, the project initiator must carry out the EIA procedure in the next step (feasibility study stage).



Source: JICA Survey Team

Figure 8.3-2 Current Conditions around South Bypass Road of Osh City

Table 8.3-2 Outlines and Issues of the Proposed Project on the View of the Environmental and Social Considerations (South Bypass Road of Osh City)

	Outlines	Issues and requirement on next step
Environment	・ The vicinity is a mainly rural area which has not been developed yet. ・ In the area of the existing road, it is estimated that negative impacts on the environment are few. ・ Since most of the newly constructed area is undeveloped steppes, negative impacts on environment are unclear as of now.	・ Detail environmental survey needs to be done in the next step. ・ The project requires EIA procedure in the Kyrgyz Republic in the next step (F/S stage).
Social (Resettlement)	・ On the area of the existing road, it is estimated that no land acquisition is required. ・ There is a settlement on the river crossing point. The settlement will be affected, and some households may be forced to involuntary resettlement.	・ The proposed project will cause involuntary resettlement. ・ In case of that, the proposed project will require Preparation of RAP (or aRAP). ・ Due to alignments, the resettlement may develop to be at a large scale. (the number of PAPs is above 200.) To reduce the number of PAPs, a suitable alignment should be examined.
On the Category of the JICA Guidelines The proposed project corresponds to “projects that may affect significant negative impacts” on JICA Guidelines. However half of the area of the project is the existing road, the newly constructed area is only 10-20km. Therefore environmental negative impacts are not significant even considering the surrounding environment (steppe). On the view of the environmental considerations, the proposed project will fall into the Category B of the JICA Guidelines. On the view of social considerations, one of the candidate routes would cause a large-scale involuntary resettlement. In that case, the proposed project may fall into the Category A. A suitable alignment to avoid a large-scale resettlement will take the Category B.		

Source: JICA Survey Team

CHAPTER 9 STUDY ON ROAD AND BRIDGE DEVELOPMENT

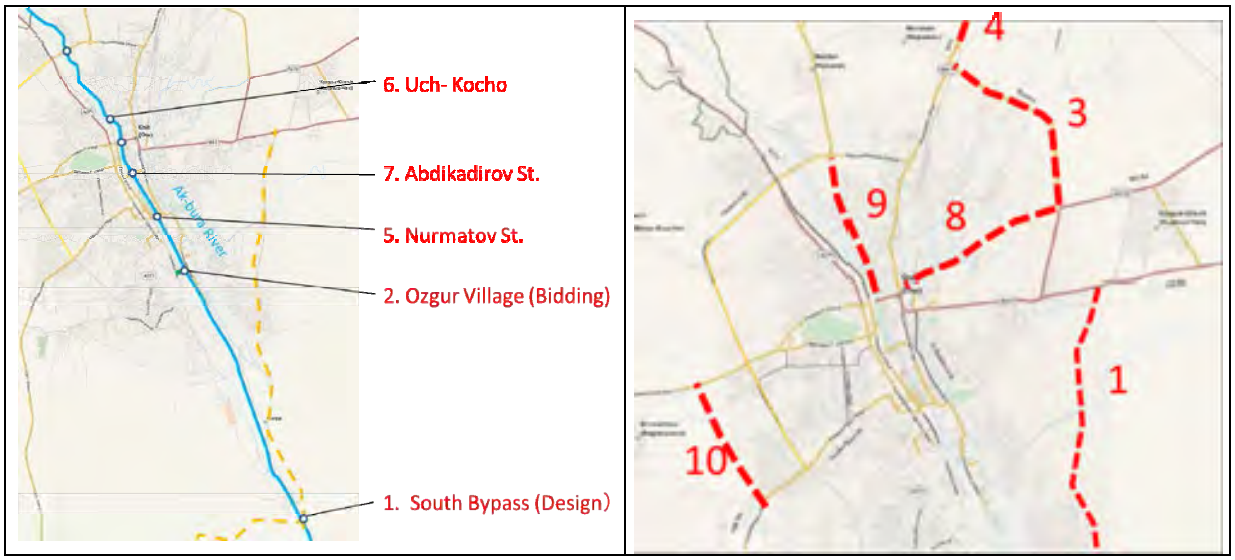
9.1 Road and Bridge Development Project

The Survey team consulted with the departments concerned with road development and the surveyed fields and concludingly identified road and bridge development projects as shown in Table 9.1-1. The concerning departments are the MOTC IPIU headquarter, OSI UAD, Osh City Road Management Department, Osh City Planning and Property Department and the Osh City Planning and Architecture Department. Those departments and others gathered at a roundtable meeting on the 11th of December 2015 at Osh City Hall and confirmed the necessity of those projects.

Table 9.1-1 Identified Road and Bridge Development Projects

No.	Project	Organization	Status
Road and Bridge Development Project			
1	Construction of South Bypass Road of Osh City	MOTC	Ongoing: Conducting design and cost estimation by Road Design Institute
2	Bridge Construction between Lenin St. and Isanov St. near Ozgur village	Osh City	Ongoing: Under bidding process
3	Improvement of Unimproved sections of Ring Road	MOTC	Survey team recommend
4	Improvement of Osh-Karasuu Road	MOTC	Survey team recommend
5	Reconstruction of Nurmatov St. Bridge	Osh City	Osh city plan
6	Construction of New Uch Kocho St. Bridge	Osh City	Osh city plan
7	Rehabilitation of Abdukadirov St. Bridge	Osh City	Osh city plan
8	Construction/Upgrading of access road (A370) between BO Road to city center	Osh City	Osh city plan
9	Construction/Upgrading of Akburinskaya St. to Osh Airport Access Road	Osh City	Osh city plan
10	Construction New road; to connect OBI Road to Osh- Aravan Road to detour heavy vehicle from Ring Road (Osmonova St.)	Osh City	Osh city plan
Enhancing Traffic Safety and Smoothness Project			
11	Improvement of Road Marking and Sign	Ministry of Internal Affairs/ Osh City	Survey team recommend
12	Enhancement of Traffic Management Capacity	Osh City	Survey team recommend
13	Improvement of Road Safety	Osh City	Osh city plan

Source: JICA Survey Team

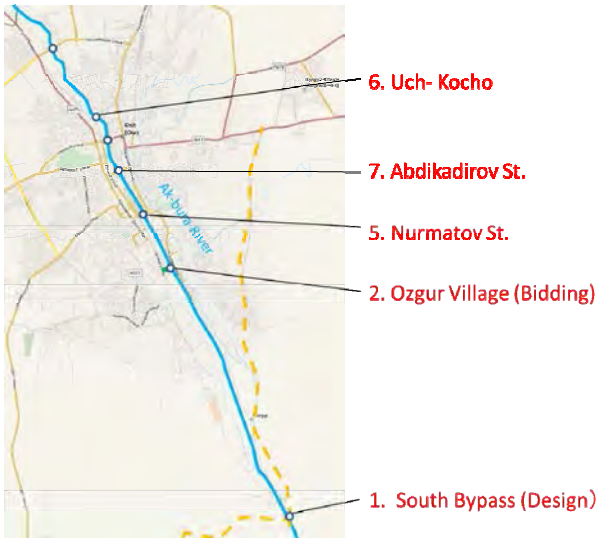


Source: JICA Survey Team

Figure 9.1-1 Location of Identified Road and Bridge Development Projects

9.1.1 Bridge Development Project

The Survey team conducted present condition survey on existing bridges, elaborated in Section "6.2 Present conditions and problem of existing bridges" and identified four (4) bridge development projects in addition to the South Bypass of Osh city planed by MOTC, namely 1) new bridge construction on the South bypass of Osh city, 5) Reconstruction of Nurmatov St. Bridge, 6) Construction of New Uch Kocho St. Bridge and 7) Rehabilitation of Abdukadirov St. Bridge.



Number is corresponding to Table 9.1-1

1) Candidate site of new bridge on The South bypass of Osh city
   - Road Design Institute is designing the bridge.

2) Bridge Construction between Lenin St. and Isanov St. near Ozgur village
- Under bidding process
- Bridge length 36m + Access road 450m
- 4 lanes

5) Reconstruction of Nurmatov Bridge
- Slab, girder, pier etc. are severely deteriorated.
- Old bridge as 58 years
- Heavy vehicles are allowed to cross the bridge

6) Construction of New Uch Kocho St. Bridge
- Osh city plans to construct 200m long new bridge through the bazaar.
- Market is planned to be moved to another place
- More than 200 people are to be resettled.

7) Rehabilitation of Abdukadirov St. Bridge
- The slab is deteriorated and may cause pavement deterioration.
- Big rehabilitation is required

Source: JICA Survey Team

Figure 9.1-2 Location of Identified Bridge Projects

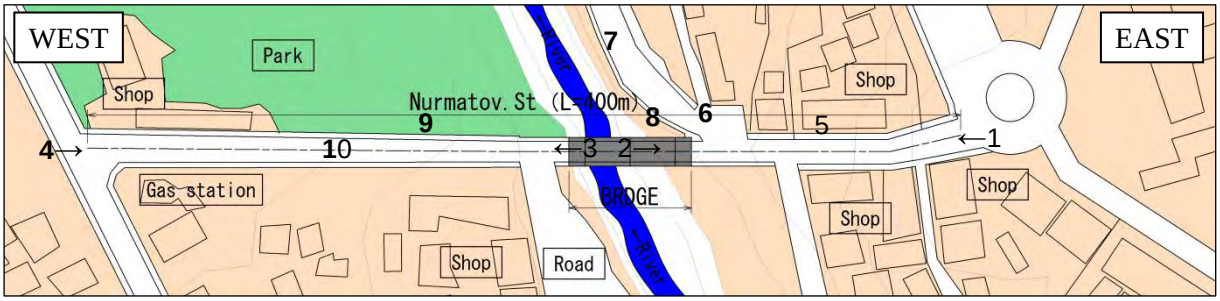
A field survey on the candidate site of the new bridge of The South bypass is also conducted and preliminary studies on bridge constructions, on the reconstruction project and the new bridge construction project are conducted. Those preliminary study results are elaborated as follows.

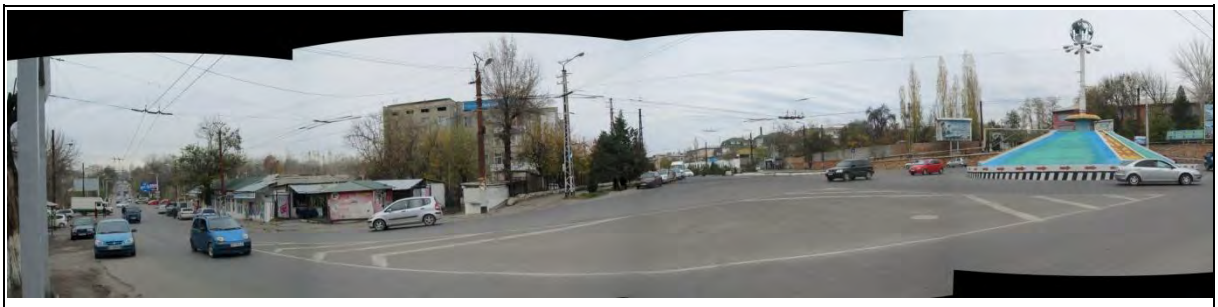
1) Preliminary Study on the Reconstruction of Nurmatov St. Bridge

i) Present Condition

The Nurmatov St. is a road, approximately 400m long with 2 lanes, which links a T-intersection on the west side and a roundabout on the east side. The bridge is approximately halfway down this road and it crosses Ak-Buura River. There are some shops beside the road to the east of the bridge and there is a connecting road to the airport, Akburinskaya St., at the east end of the bridge. This intersection causes traffic jams due to bad alignments of Akburinskaya St, touching Nurmatov St. at a sharp angle. Therefore, Osh city requests to improve this intersection. At the west of the bridge, on the north side of the road, there is a

park and there is a restaurant near the T-intersection. At the west of the bridge, on the south side of the road, a minor city road accesses to the Nurmatov St., there are a shop and a gas station. There is a pipe culvert under the road to the west of the bridge.





1.The eastern intersection to Nurmatov St.

2.The east end of the bridge looking to the northern intersection to the airport

3.The west end of the bridge looking to the western T-intersection

4.The western T-intersection

5.Some shops on the east side

6.The northern intersection to the airport

7.On the Akburinskaya St.

8.Looking from the right bank at the bridge

9.The park on the west side

10.The pipe culvert

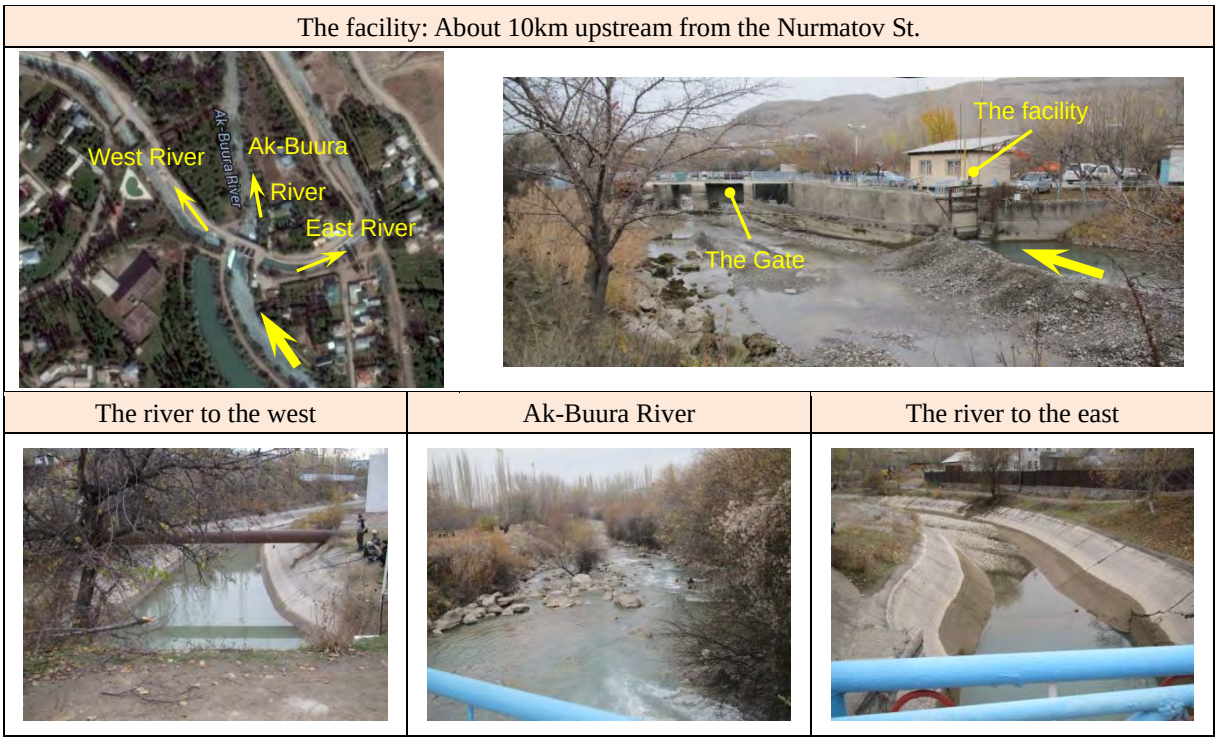
Source: JICA Survey Team

Figure 9.1-3 Present Condition of the Nurmatov St.

ii) The Condition of Ak-Buura River

The discharge of Ak-Buura River is managed by a river control facility, which is located about 10 km upstream from the Nurmatov St. This facility divides the river from the south side into three rivers. The following information on Ak-Buura River was obtained during an interview with a staff of this facility.

- Flow data is recorded.
- A maximum discharge is recorded at about 110 m^3/sec.
- The maximum design discharge is 150 m^3/sec.
- April and May show the highest flow. Therefore construction work is recommended to be avoided during this period.
- September shows the lowest flow.
- The canals at the east and at west, distributed from Ak-Buura River, are used for agricultural water. Whereas, Ak-Buura River's water is regulated.
- The riverbed at the downstream of Ak-Buura River, outside of Osh city, provides aggregates for an asphalt plant, which is located nearby.



Source: JICA Survey Team

Figure 9.1-4 River Control Facility

iii) Design considerations

The Survey team carried out the field survey jointly with the Road Management Department. The Survey team identified the following points for consideration when planning the bridge on the Nurmatov St.:

- Road widening is required from 2 lanes to 4 lanes. (Road width:14.0m→20.8m)
  The necessity of the road widening is also confirmed by the traffic survey and traffic demand forecast conducted within this survey. The vehicle capacity ratio (VCR) of the road calculated by standard design capacity[1] and estimated Annual Average Daily Traffic (AADT)[2] volume, is 1.43. It is much higher than the ordinary congested value of 1.25. Furthermore, the daily hours exceeding the hourly capacity[3] are already 3 hours during morning and evening peak hours. The estimated future traffic volume in 2020, with considerations to the construction of the South Bypass of Osh city and the new bridge at Ozgur village, the hours, in which traffic exceeds the hourly capacity will stay the same, even though the traffic volume will slightly decrease.
- The shops on the eastern side are temporary shops and can be relocated or moved by Osh

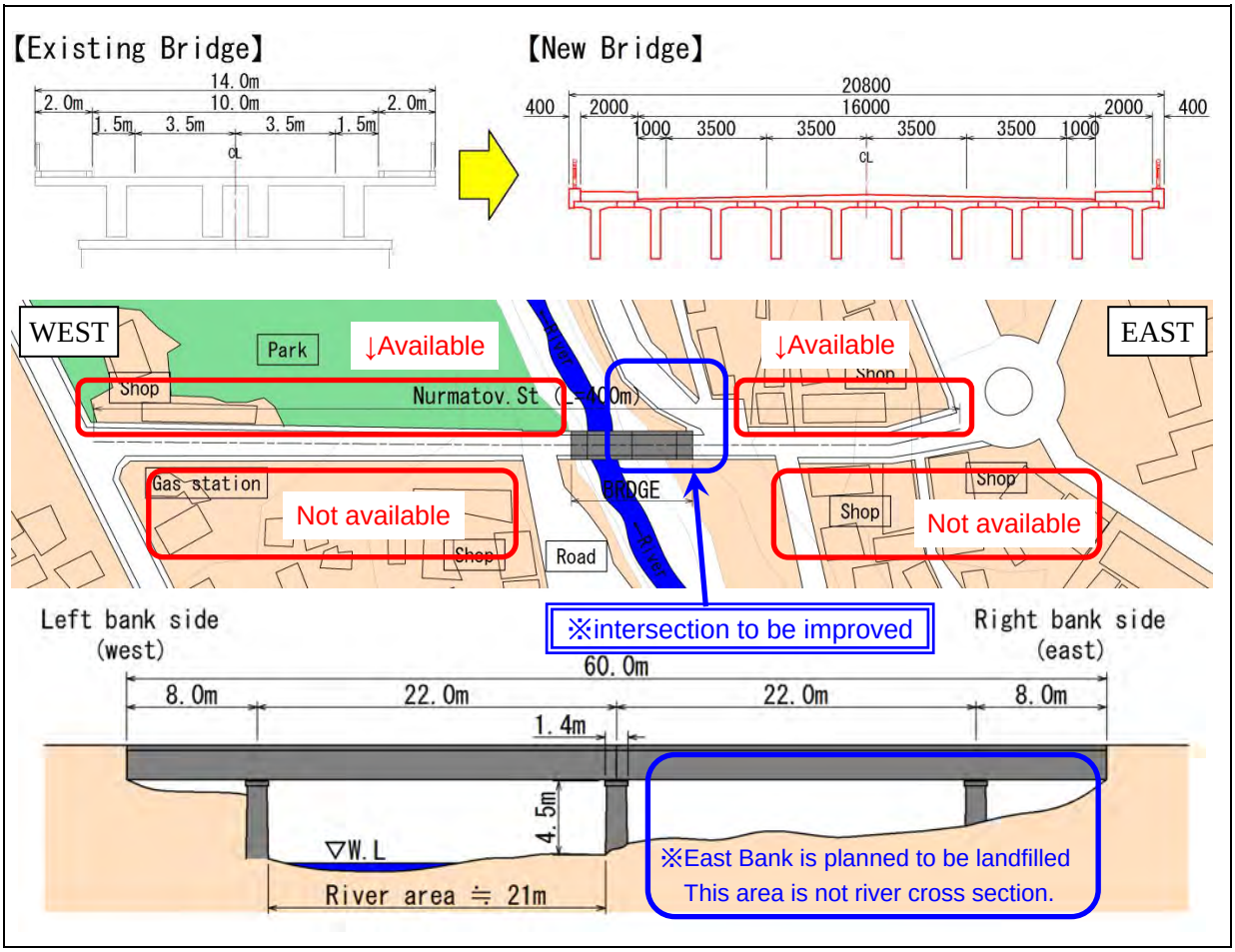
[1] Daily standard design capacity of each lane is 14,000 pcu/day. The road has two lanes, therefore daily capacity is calculated as 28,000 pcu/day.

[2] Traffic volume of the survey is 35,400pcu/day and seasonal conversion ratio is set as 1.13. About 40,000 pcu/day is estimated as an AADT by multiply those numbers.

[3] Hourly capacity of two lanes is 3,600pcu/h and service factor is set at 0.8. Estimated hourly capacity is 2,880 pcu/hour by multiply those numbers.

city authorities.

- The land of the park can be used for widening the road. It also can be used as a construction yard.
- The western side shops on the south road side are difficult to relocate.
- Osh city requests to improve the intersection at the east end of the bridge at the same time of improving Nurmatov St. and Bridge.
- Osh city planned and partially conducted a landfilling at the east bank of the River around the bridge piers. The present river cross section is about 21m.
- The river flow is controlled by the river control facility. Therefore, the river scarcely overflows. The east bank can be used for construction.



Source: JICA Survey Team

Figure 9.1-5 Design Consideration

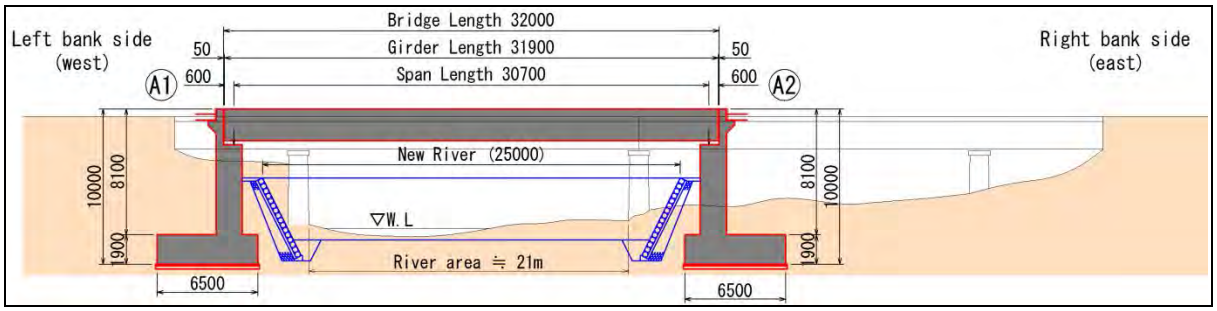
iv) The basic Plan of New Bridge

The points of the basic plan of the bridge are listed as bellow.

- No pier should be constructed for the new bridge in the river's cross-section.
- The bottom of the girder of the new bridge shall be higher than the existing one and the height of the road shall be equal to the existing one.
- The foundation type of the new bridge is assumed to be a spread foundation, which is the

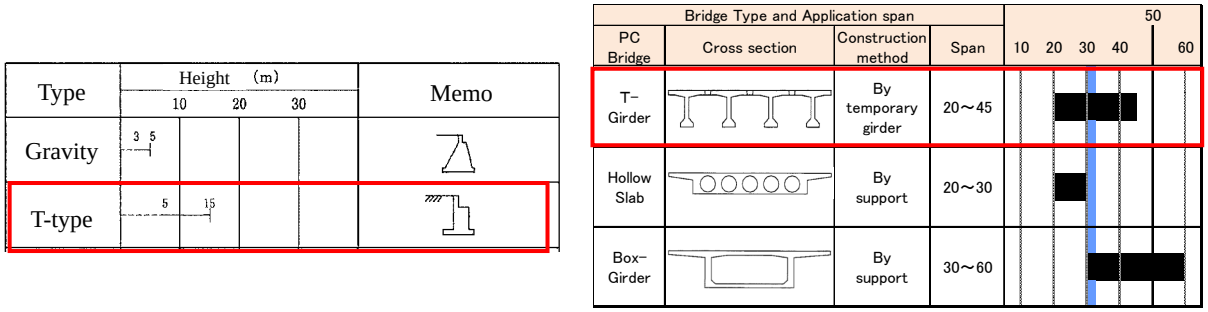
same type as the Navoi St. Bridge.

- The abutment type of the new bridge is assumed to be an inverted T-type abutment, in reference to Japanese standards.
- The superstructure of the new bridge is assumed to be a T-type girder in reference to Japanese standards since the bridge length is 32 m. T-type girder was also applied to the Kugart River Bridge and is in general, more economical than steel bridges at a length exceeding 30m.



Source: JICA Survey Team

Figure 9.1-6 Plan of the New Bridge



Source: JICA Survey Team

Figure 9.1-7 Basic Types of the Bridges in Japanese Standards

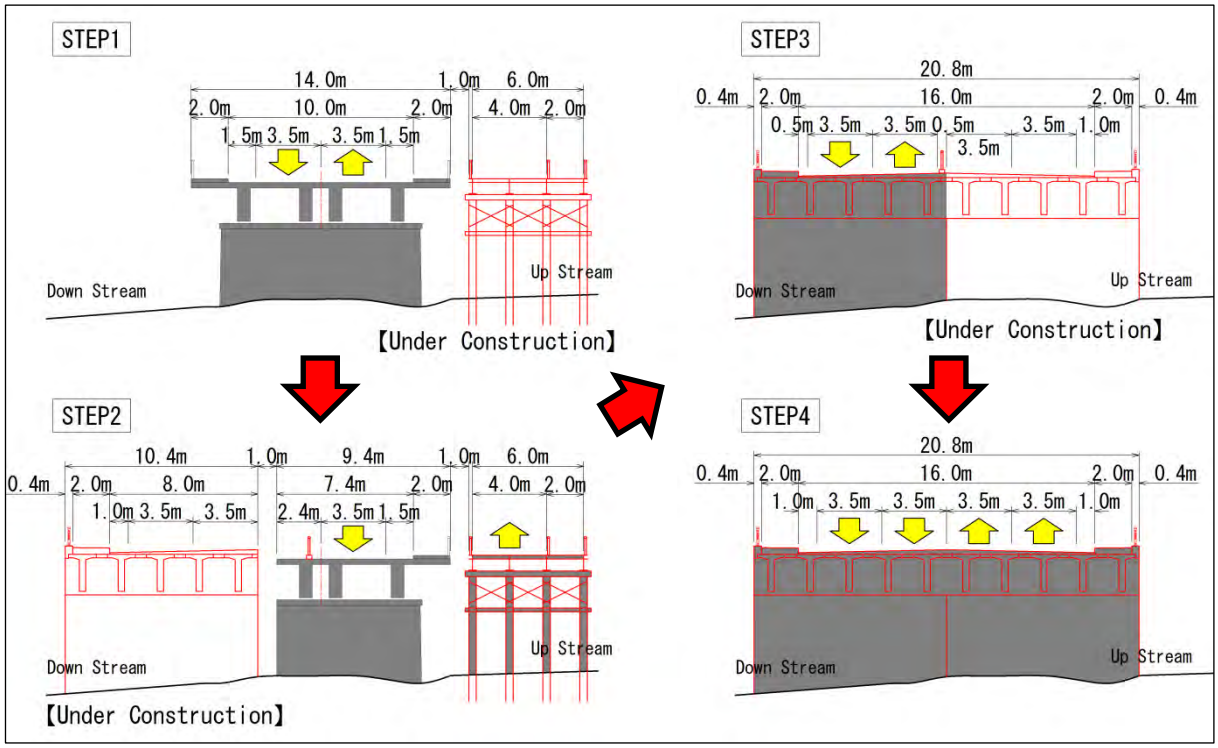
v) The road alignment plans by the construction works

Nurmatov St. Bridge is the only bridge which allows heavy vehicles to pass in the City. Therefore, Osh city requests to keep traffic, including heavy vehicles, crossing the River during the reconstruction of the bridge. To comply with this request, two options are studied: option 1 is to use a temporary bridge, and option 2 is not using a temporary bridge. Explanations of each option are as follows.

a) The option 1: Construction work using a temporary bridge

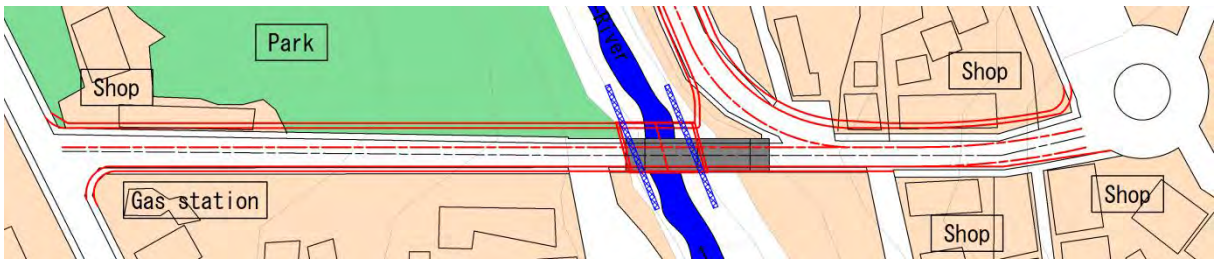
The steps of the construction work are shown below. At STEP 1, a temporary bridge is constructed for vehicles and pedestrians, located 1 m upstream of the existing bridge. At STEP 2, after completing the temporary bridge, the downstream half of the existing bridge is demolished and the new bridge is constructed at the demolished place. At STEP 3, vehicles and pedestrians can use the downstream half of the new bridge while the upstream half of the

existing bridge is being demolished and the temporary bridge is being removed. STEP 4 shows the picture of new bridge completed.



Source: JICA Survey Team

Figure 9.1-8 Option 1: Construction Work Using a Temporary Bridge



【Points to consider for option 1】

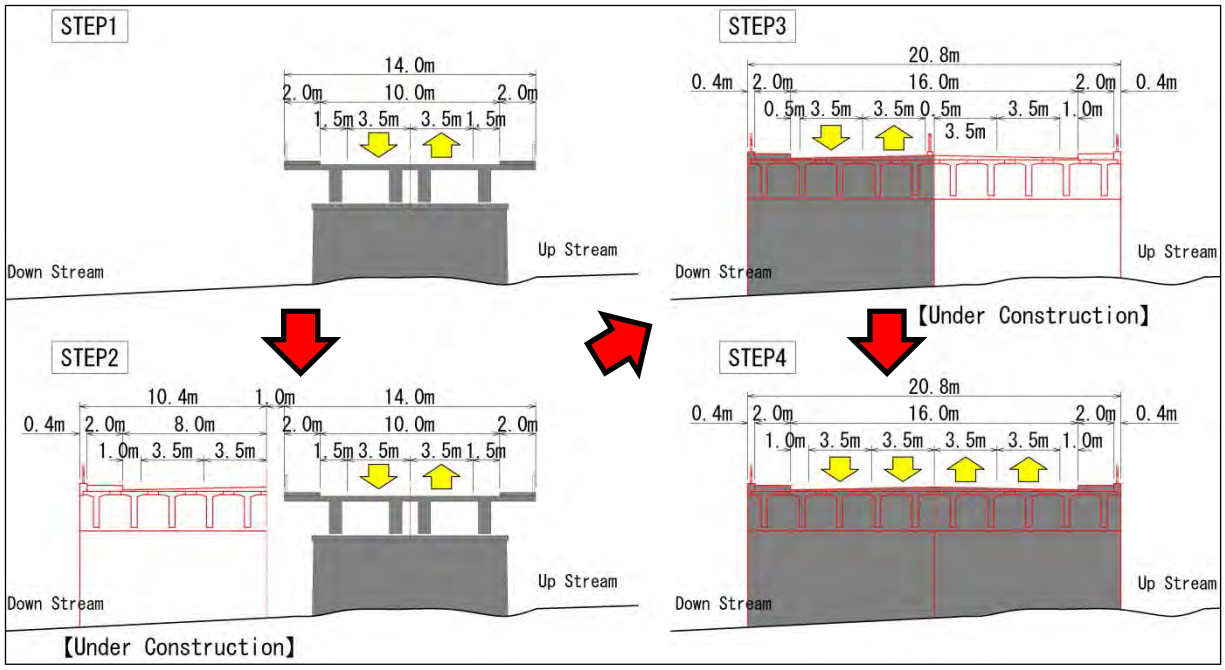
- The north side of the existing Nurmatov St. is widened.
- There is less influence on the shop and the park on the north side than with option 2.
- The construction period and cost of construction would be higher compared to option 2, because of the temporary bridge.

Source: JICA Survey Team

Figure 9.1-9 Points to Consider for Option 1

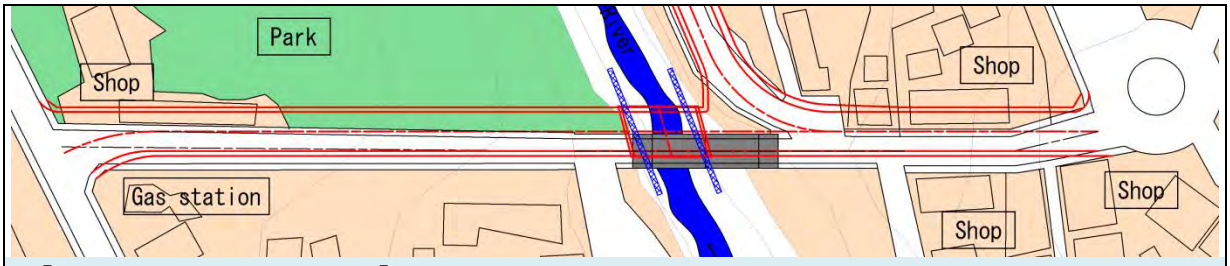
b) The option 2: Construction works without a temporary bridge

The steps of the construction work are shown below. At STEP 1, the existing bridge is continuously used. At STEP 2, a half of new bridge is constructed at downstream of the existing bridge. The space between the new bridge and existing is necessary for construction work. At STEP3, the half of new bridge at downstream is open to vehicles and pedestrians, and all of the existing bridge is demolished and rebuilt. STEP 4 shows the picture of new bridge completed.



Source: JICA Survey Team

Figure 9.1-10 Option 2: Construction Work without a Temporary Bridge



【Points to consider for option 2】

- The whole road alignment is shifted greatly in comparison with option 1.
- There is more influence on the shop and park on the north side than with option 1.
- The construction period would be shorter compared with option 1, because a temporary bridge will not be constructed.

Source: JICA Survey Team

Figure 9.1-11 Points to Consider for Option 2

vi) Cost Estimation of the New Bridge and Road

The cost estimations of each option are shown in Table 9.1-2. The construction work includes an improvement of the road (L=320m) from the eastern intersection to the Nurmatov St, in order to smoothen the traffic flow access to the improved bridge and road.

Source: JICA Survey Team

Figure 9.1-12 Additional Plan for Road Improvement

The cost estimation of option 1 without the additional road improvement is 1,140 million JPY and option 2 is 1,120 million JPY. The cost estimation of option 1 with the additional road improvement is 1,280 million JPY and option 2 is 1,270 million JPY.

Table 9.1-2 Cost of Construction Work

Unit: million (JPY)

Contents		Option 1	Option 2	Option 1 +additional	Option 2 +additional
Nurmatov St	Superstructure	250	250	250	250
	Substructure	470	470	470	470
	Revetment etc.	80	80	80	80
	Temporary bridge	80	—	80	—
	Removal	30	30	30	30
	Road	100	170	100	170
Additional	Intersection	—	—	50	50
	Road	—	—	80	80
Cost of construction		1010	1000	1140	1130
DD・SV		130	120	140	140
Cost of construction work		1140	1120	1280	1270

Source: JICA Survey Team

vii) Recommendations for Further Work

The Survey team recommends a further study on the bridge design in order to comply followings;

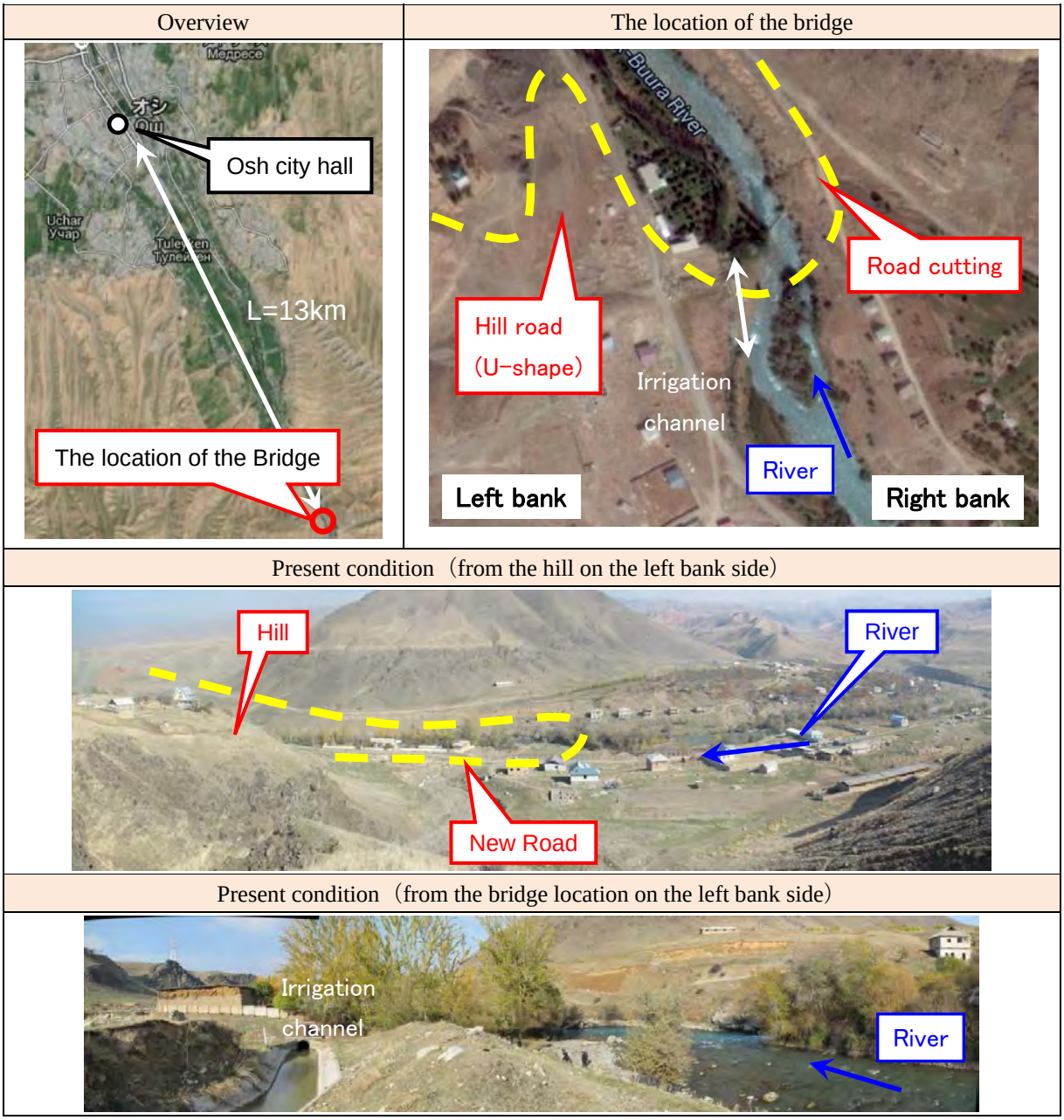
- To design the foundation type using ground survey data,
- To confirm the river conditions by collecting information related to the discharge of the river flow and rain precipitation.
- To confirm the possibility of relocation of shops, using the park land and using the minor city road.

- To review the bridge type, including considering steel bridge types.

2) Preliminary Study on New Bridge Construction on South Bypass of Osh City

i) Present Condition

The bridge location and present condition of the South Bypass (Plan) are shown below. The location is at 13km southeast of Osh city. The yellow line on the map is the road alignment plan that was acquired during the survey by the Road Design Institute (DI). This road crosses the river and an irrigation channel. Currently, this road plan has deep cutting, road alignments of U-shape and an overpass of a high hill on the left bank side. There are some residential houses but the survey team considers that impacts of the new road on them are not going to be severe.



Source: JICA Survey Team

Figure 9.1-13 Bridge Location and Present Conditions near the New Bridge

River (Upstream)	River (Downstream)	Canal
		
A view from right bank to left bank (Front: Community road at right bank, W=7.0m)		Community Road at Left Bank W=6.5m
		

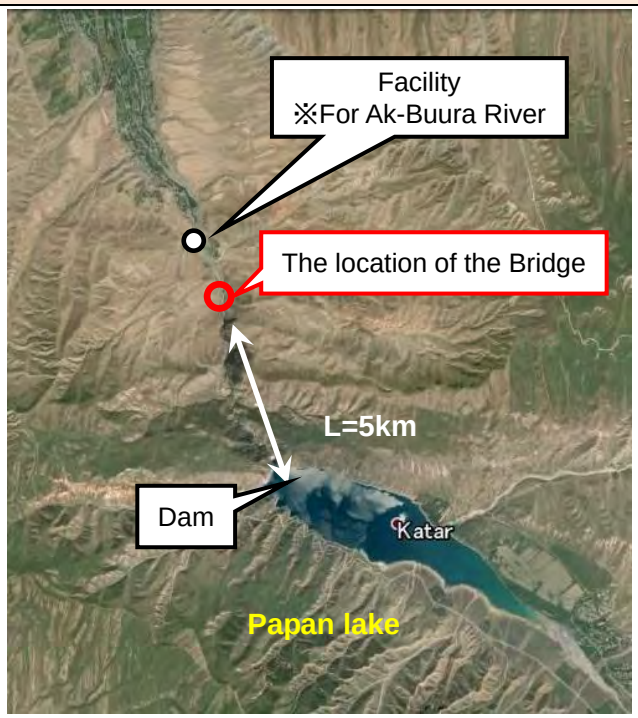
Source: JICA Survey Team

Figure 9.1-14 Conditions of Bridge Location and Affected Structures

ii) River Condition

The discharge of this river is managed by the Papan Reservoir, which is located at about 5km upstream from the new bridge. The maximum discharge is 345 m³/sec, according to the notice board in front of the downstream facility of the Papan Reservoir.

Papan Reservoir



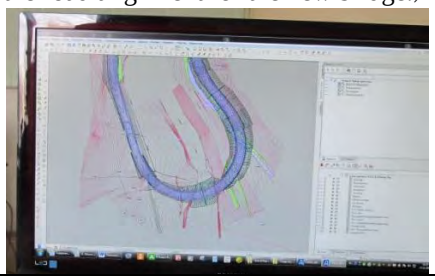
Source: JICA Survey Team

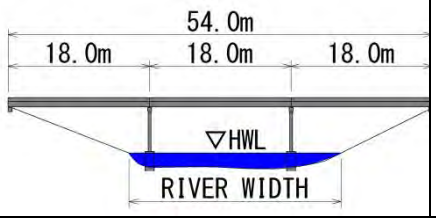
Figure 9.1-15 Papan Reservoir

iii) Review of Plan by Road Design Institute

The survey team interviewed the Road Design Institute (DI) under the Kyrgyz Republic's Ministry of Transport and Communications (MOTC), which plans and designs the South Bypass Road of Osh City. Detailed drawings and basic calculations for the bridge were not provided, however, some basic information about the bypass plan was provided. The survey team reviewed the bypass plans and the results of the review are stated in Table 9.1-3.

Table 9.1-3 Review of Plan by Road Design Institute

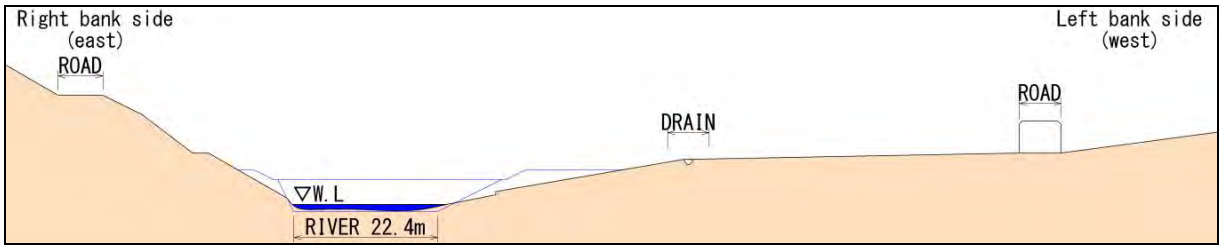
<table>
<tr><th colspan="2">Plan by the Design Institute</th><th>Review</th></tr>
<tr><td>Road width</td><td>The number of lanes is two lanes (2×3.5m) by Category III in GOST standard.</td><td>No comment</td></tr>
<tr><td>Road gradient (Longitudinal)</td><td>The maximum degree of slope is 7%.</td><td>7% is very steep for the big vehicles, so their uphill speed will be very slow. It is better to have gradients less than 7% if possible. For instance, Japanese Road Standard defines design speed and allowed maximum degree of the slope with its length as shown in the following table.
<table>
<tr><th>Design Speed</th><th>Degree of Slope</th><th>Length</th></tr>
<tr><td>60km/h</td><td>6%
7%
8%</td><td>500m
400m
300m</td></tr>
<tr><td>50km/h</td><td>7%
8%
9%</td><td>500m
400m
300m</td></tr>
<tr><td>40km/h</td><td>8%
9%
10%</td><td>400m
300m
200m</td></tr>
</table></td></tr>
<tr><td>Road alignment for the new bridge</td><td>The road alignment for the new bridge is a curve.（The below photo is a plan of the road alignment for the new bridge.）  </td><td>It is necessary to widen the road in cases with a curved road alignment in order to accommodate the interval of tires of large vehicles. Therefore, the curved road is double the width of a road with straight alignment. The wider road means a wider bridge, and this also increases the construction costs.</td></tr>
<tr><td>Height of road</td><td>The height of the road is equal to the height of the road on the left bank.</td><td>The height of the existing road on left bank is lower than the road on the right bank side. The new plan includes a deep road cutting on the right bank side, so the road height will be the same as left bank side. In addition, there is a steep road gradient at the left side beyond the bridge and left bank, because of a high hill. The cutting has a risk of slope failure and the steep road will impede the travel speeds of large vehicles.</td></tr>
<tr><td>Type of bridge</td><td>The type of bridge is reinforced concrete (RC) T-girder. The bridge length is 54m and the bridge has 3 spans. (The length of one span is 18m.)</td><td>The Survey team believes this bridge design, by DI, is same as the bridge on Kasymbekova St. Since the maximum length of the span is 18m in Kyrgyz, due to technical constraints.</td></tr>
</table>

Plan by the Design Institute		Review
River condition	The survey team believes the piers are located on the river. (The below drawing is a hypothesis made by the survey team.) 	The span of the bridge on the Navoi St. is 18m. The maximum discharge of the river under the bridge on the Navoi St. is 150 m³/sec, whereas the maximum discharge of the river under this bridge is 345 m³/sec. Because of double, the discharge, thorough survey and careful design are required in order to safely locate the piers in the river to control water appropriately.

Source: JICA Survey Team

iv) Point of Our Proposal Plan

Based on the review results, the Survey team proposed a new plan.
The below drawing is a cross section from a basic land survey undertaken by the survey team. There are two roads that serve the houses on either side of the river. The road at the right side is about 9m higher than that at left side. There is an irrigation channel, which is described as "DRAIN" in the following figure, where 30m riverside form the road on the left bank. The width of the river is about 23m.

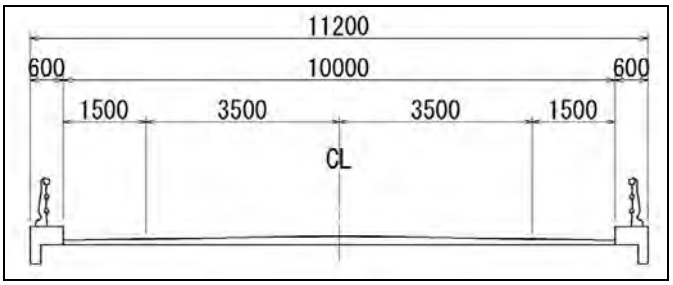


Source: JICA Survey Team

Figure 9.1-16 Cross Section from a Basic Land Surveying

The points of the plan proposed by the survey team are listed below.

- The height of the new road is to be equal to the height of existing road at the right bank side. −>avoid a deep road cutting on the right bank side.
- The height of the new road is to be kept at the height of existing road on the right bank side in order to connect smoothly to the high hill on the left bank side. The new road is higher than the existing road on the left bank side. −>smoother transition to the high hill at the left bank side.
- Minimum span of the new bridge is to be more than 20m, according to Japanese standards. （The calculation of the minimum span (L) is as follows: L=20+0.005×Q, where Q is the maximum discharge of the river, which is between 200 m³/s and 400 m³/s according to the Papan Dam） −> avoid locating piers in the river
- New road width is to be as shown in the below drawing.（according to Category III in GOST standard）

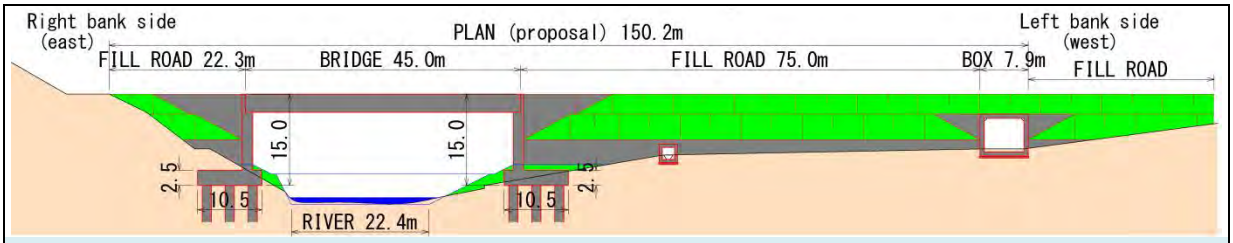


Source: JICA Survey Team

Figure 9.1-17 New Road Width

v) Basic Plan of the New Bridge

The length of the new bridge is determined by the limitations of abutment height that can be built. In option 1, the maximum height of the abutment is applied. The maximum height of the abutment is 15m and inverted T-type abutments are proposed. Therefore, the length of the bridge would be 45m and prestressed concrete (PC) T-girders are proposed for the superstructure. In option 2, smaller abutments are proposed for the embankment road. The position of the abutments depends on the shape of the embankment road. The length of this bridge type would be 90m and it is impossible to apply a single-span bridge for such a long bridge. Under these circumstances, the survey team proposes an inclined leg rigid-frame bridge. It is possible to reduce the volume of concrete and cost of construction with this bridge type.

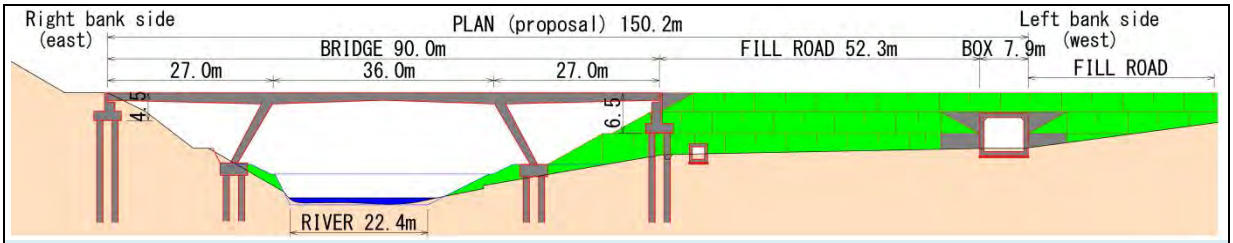


【Points】

- Superstructure is PC T-girder with a span of 45m.
- Aesthetics of the bridge are poor because the girder is thick.
- Sub-structure is large and dominant in construction work

Source: JICA Survey Team

Figure 9.1-18 Option 1: T-girder Bridge

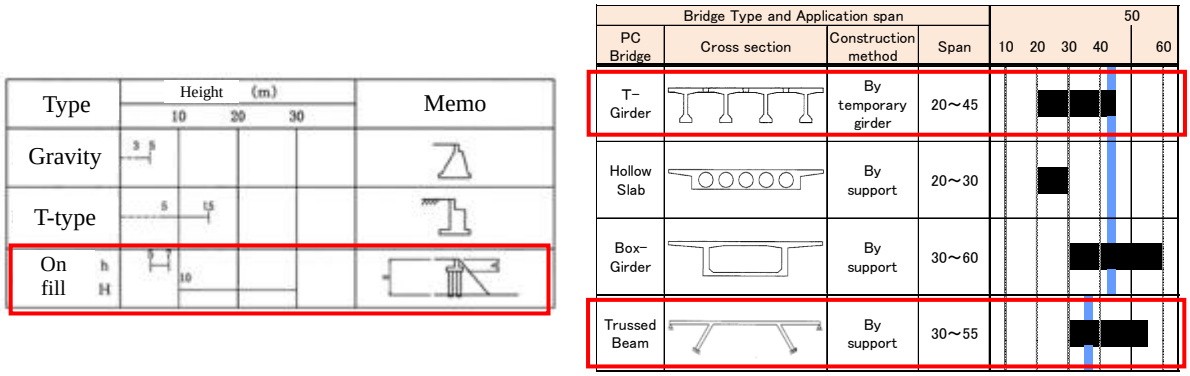


【Points】

- Superstructure is a rigid-frame bridge with a span of 90m, which reduces costs.
- Aesthetics of the bridge are good because the girder is not too thick.
- Superstructure is large and dominant in construction work

Source: JICA Survey Team

Figure 9.1-19 Option 2: Inclined-leg Rigid-frame Bridge



Source: JICA Survey Team

Figure 9.1-20 Basic Types of Bridges in Japanese Standards

vi) Cost Estimation of New Bridge and Road

The cost estimations of each option are shown in Table 9.1-4. Unit cost is estimated upon previous experiences of bridge construction projects in Kyrgyz.

Table 9.1-4 Cost of Construction Work

Unit: million (JPY)

Contents	Option 1 (PC T-girder)	Option 2 (Rigid-frame)
Superstructure	220	360
Substructure	470	280
Revetment etc.	60	60
Road	50	30
Calvert	120	120
Cost of construction	920	850
DD・SV	110	110
Cost of construction work	1030	960

Source: JICA Survey Team

vii) Recommendations for Further Work

The Survey team recommends further studies on bridge design as follows;

- To confirm the design conditions with the Ministry of Transport and Communications (MOTC),
- To design the foundation type using ground survey data,
- To confirm the river conditions by collecting information about discharge, water utilization, bank usage for construction yards and affection by water pollution in the downstream, and
- To review the bridge type, including considering steel bridge types.

9.1.2 Road Development Project

1) Present Condition

Substantially described in section "6.1 Present Road condition and problem", following problems are identified on road transport in and around Osh city;

➢ Road Network Issues

- Traffic congestion on the major streets in central city
- International transport concentrate on major city roads and pass through Osh city
- Insufficient capacity of bridge links crossing the river

➢ Road Condition

- Several signalized intersections and partial roundabouts are reaching excess traffic capacity levels
- High occupancy of on-street parking in central area and a lack of off-street parking facilities
- Lack of a well-developed traffic management system (traffic signal control, channelization with marking, pedestrian facilities, off-street parking facilities with traffic enforcement, bus bay and etc.)
- Poor road surface conditions, partially at international and national roads
- Insufficient road safety system

2) Identified Project

Six (6) road development projects are identified, namely, 1) Construction of South Bypass Road of Osh City, 3) Improvement of Unimproved sections of the Ring Road, 4) Improvement of Osh-Karasuu Road, 8) Construction/Upgrading of access road (A370) between BO Road and the city center, 9) Construction/Upgrading of Akburiskaya St. to Osh Airport Access Road and 10) Construction of the New road to connect OBI Road to Osh- Aravan Road to detour heavy vehicle from the Ring Road (Osmonova St.).

Numbers are corresponding to Table 9.1-1


1) Existing road for South BP; Severely Deteriorated Asphalt Pavement

3) Unimproved sections of the Ring Road; Daily Traffic Volume: 8,400 vehicle/day (467 Heavy Vehicle/day)

4) Osh-Karasuu Road; Deteriorated Pavement, Daily Traffic Volume: 23,600 vehicle/day (287 Heavy Vehicle/day)

8) Access road (A370) between BO Road and the city center; Gravel Road, through residential area

9) Akburinskaya St. to Osh Airport Access Road; Gravel Road, through a residential area

10) A new road connecting OBI Road to Osh- Aravan Road; Exact route has not been confirmed.

Source: JICA Survey Team

Figure 9.1-21 Locations and Conditions of Identified Road Projects

9.1.3 Project for Enhancing Traffic Safety and Smoothness

1) Signalized Intersection Improvement

i) Present Condition

In Osh city, 41 intersections are signalized. Each intersection is optimized for phasing and timing, but they are not coordinating with each other. Only one pattern of phase and timing is applied to each intersection for the whole day. In the city center of Osh, four (4) particular signalized intersections are severely congested during peak hours.

Traffic Signals do not have a backup system, therefore, the signals turn off, when the electric grid suffers a break down.

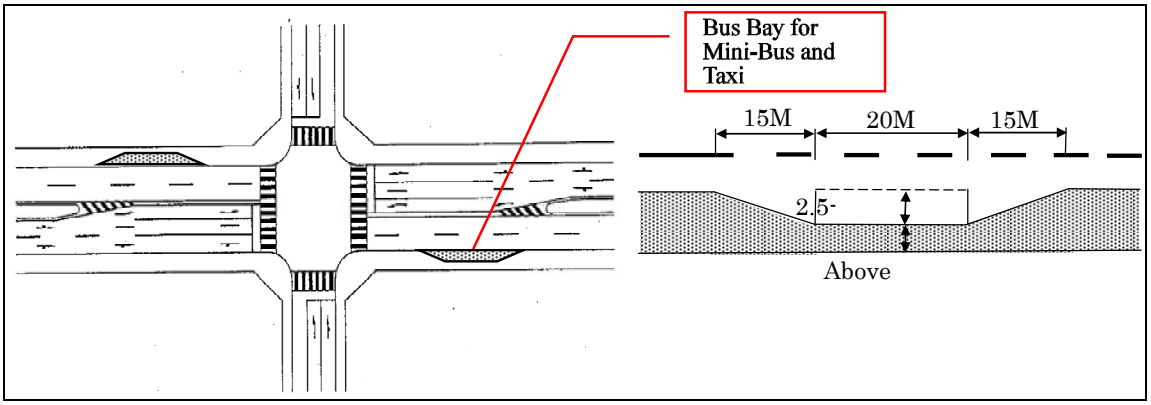
ii) Identified Project

The Osh City Road Department plans to update 15 intersections by replacing old signals and requested this in the budget of 2016. However the request was rejected and the Osh City Road Department will apply for funds again next year.

iii) Recommendation

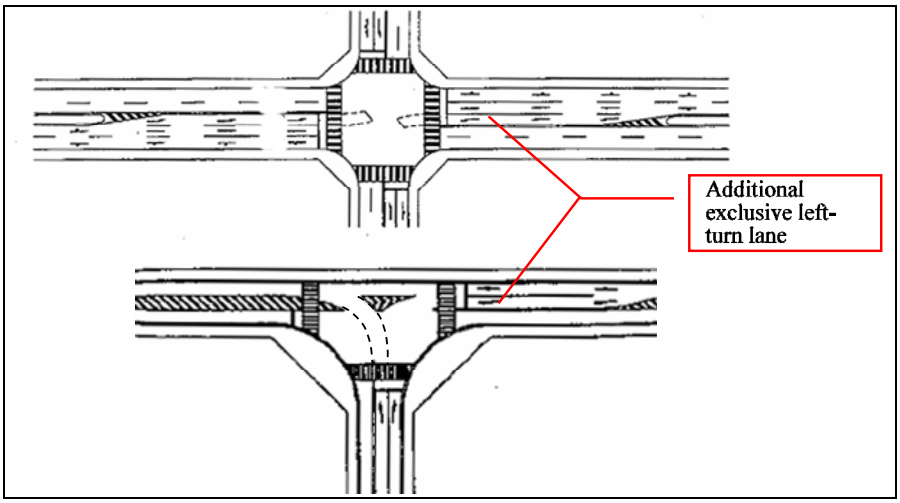
Technologies for the improvement of signalized intersection are mainly optimizing signal phases and increasing the efficiency of space usage in and around the intersection. There are several ways of improving intersections, however the most important thing is planning appropriate solutions upon analyzing traffic issues by a scientific approach. Traffic condition may change by road condition, road closure, road / bridge construction and any other reasons. Agencies responsible for the traffic management shall have an expertise in traffic analysis and countermeasures. Through tackling present traffic issues as pilot projects with international experts, the traffic management officers' capacity will be enhanced. For instance, through the following possible activities;

- Enhance traffic enforcement of on-street parking. To be elaborated later.
- Install bus bays for mini-buses and taxi pools at the exit of the intersection,
- Introduce a "Channelization System", exclusive left-turn/right-turn lanes will be installed at intersections with a high volume of left-turning traffic and right-turning traffic, in order to ensure the smooth flow of straight-through traffic and to process left-turning traffic and right-turning traffic more efficiently. To increase exclusive lanes within present carriageways, special short width shall be applied, and
- Introduce signal control systems of pre-timed operation with multi-program corresponding to traffic flow at peak and off-peak times. In addition, introduce the method of a coordinated control system at continuous intersections. It is also recommended to install an effective backup system to sustain signals even during electric power failure.



Source: JICA Survey Team

Figure 9.1-22 Layout of Bus Bay at the Exit of an Intersection



Source: JICA Survey Team

Figure 9.1-23 Layout of an Additional Exclusive Left-Turn Lane by a Channelization System

2) Roundabout Improvement

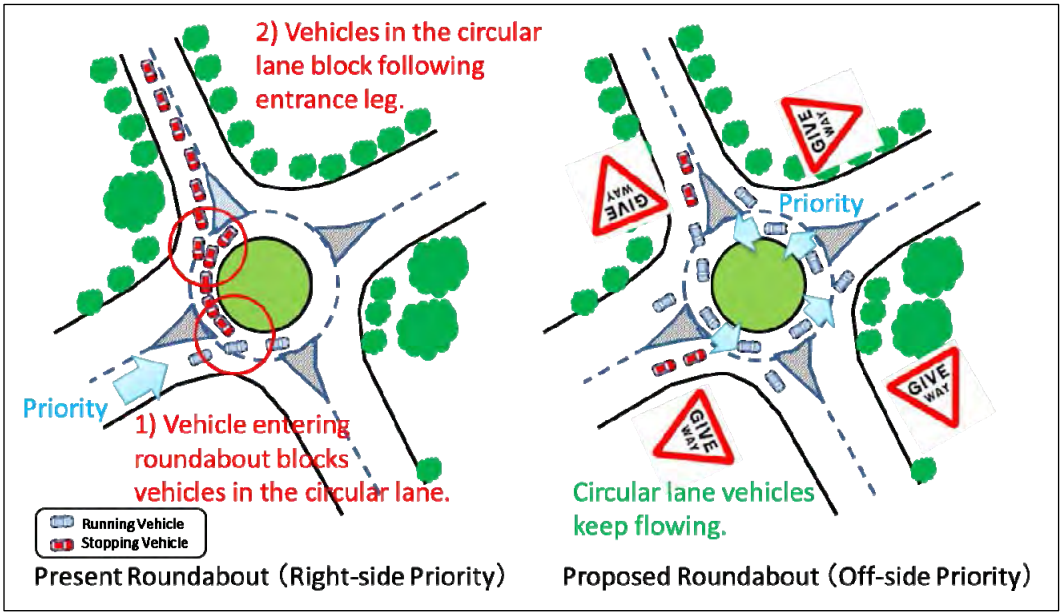
i) Present Condition

The Barsbek roundabout at the Osh-Aravan Road and Ring Road (Osmonova St.) is regarded as a bottleneck. The Osh City vice mayor is responsible for a task force to alleviate the severe congestion at this roundabout. (See "4.2.7 Intersection and Roundabout")

ii) Recommendation

Traffic enforcement of on-street parking shall be strictly reinforced. At the same time, availability of adjacent farmland to facilitate poor taxi parking and parking for shops around the Barsbek roundabout shall be studied.

Traffic rules at the roundabout apply right side priority in Kyrgyz, therefore, the vehicles in the circular lane have to stop when a vehicle is entering to the roundabout from an approach ahead. Under this rule, stopping vehicles in the circular lanes easily block following entrance legs, especially at small diameter roundabouts. Those issues have been studied in United Kingdom (UK) and in the 1960s "Give-way" signs at approaches have become the universal rule as they give priority to the circulating vehicles. Even though right side priority is general in Kyrgyz, "Give-way" signs can be installed and regulated at this intersection as a pilot study, before installing traffic signals or conducting physical improvements. At this time, illegal parking enforcement shall be conducted.

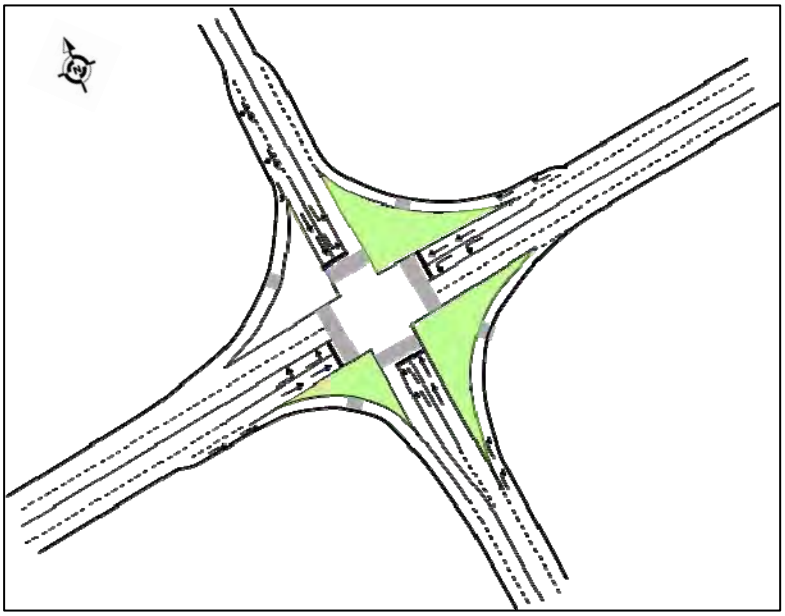


Source: JICA Survey Team

Figure 9.1-24 Present Problems at Barsbek Intersection and Proposed Improvement

According to the experiment in the UK, a signalized roundabout where the circular lane is blocked increased the mean flow by 10% by installing traffic signals at the roundabout. It is noted that the signals worked during peak hours only because the roundabout can minimize the delay of vehicles during off-peak hours.

However, considering the increasing traffic volume foreseen, the Survey team proposes further improvement plan to a signalized intersections without a center island. The concept of an at-grade signalized intersection is shown in Figure 9.2-25.



Source: JICA Survey Team

Figure 9.1-25 Layout of Further Improvement Plan for Barsbek Roundabout

3) Parking Management

i) Present Conditions

Parking space is not sufficiently prepared in Osh city. According to the Department of Parking, Stops and Garages Management, the city's land properties, which potentially could have been used for parking space, have already been transferred to the private sector. Therefore, to develop new parking space, land acquisition is required, which leads to the need of a bigger budget and makes implementation difficult.

Osh city has regulated building parking lots for developing new buildings in 2015.

ii) Identified Project

- The Department of Parking, Stops, and Garages Management plans to increase city on-road parking lots from 10 to 27.
- The Department of Parking, Stops and Garages Management proposed to the city council to utilize the space of under the Navoi Bridge for new parking space for bazaar users.
- Osh city will install CCTV cameras for monitoring and enforcing regulations of illegal parking around intersections.

iii) Recommendation

To facilitate parking space is an important duty for traffic management, on the other hand, to strengthen the enforcement is another necessity. The Traffic police has the duty to regulate illegal parking, however, because of limitation of human resources, enforcement is not sufficient. Therefore, Osh city plans to install CCTV cameras to regulate traffic violations, including illegal parking, instead of traffic police patrol. Lessons from other countries, when introducing parking enforcement officers or traffic wardens can be worth studying. Strictly enforcing parking violation could also spur the private sector to start operating parking businesses.

In the view of urgent improvements in order to reduce traffic congestions, it is recommended to focus on the removal of parking vehicles within 5-10 m of intersections. Marshrutkas, stopping in intersections for boarding and alighting, also intervene with the traffic movement and therefore, their movement shall be controlled.

4) Road Marking and Road Signs

i) Present Condition

Road markings and road signs are in a poor condition in Osh city. Over the past 30-40 years, road signs have not been repaired and updated sufficiently. Roads are wide, but still, the lack of road marking decreases their traffic capacity.

Osh city outsources road marking works in the case of large volume works. In the case of a

small portion of road marking works, Osh city nominates the Construction Maintenance and Operation Department (CMOD) of Osh Traffic Police. CMOD has allocated a budget for hiring temporary staffs to conduct road markings, but due to the limitation of machinery it has not been able to execute the whole budget.

Old Aerial Work Platform Vehicle

Road Marking Machine

Old Road Marking Machine

Road Sign

Damaged Road Sign

Old Road sign (Back side)

Source: JICA Survey team

Figure 9.1-26 Road Marking Equipment in CMOD

ii) Recommendation

Enhance the capacity of road marking and road signs of the Construction Maintenance and Operation Department.

5) Pedestrian Overpass

i) Present Condition

There is neither a pedestrian bridge nor pedestrian underpasses in Osh City. Whereas, a pedestrian bridge was constructed in Jalal-abad city at the location of a bazaar and a parking lot, the cost was approx. 5 million KGS (equivalent to approx. 60 thousand USD). The pedestrian over bridge was funded by the city and constructed by a construction company from Osh. In Jalal-abad, pedestrians are physically separated from carriageways by robust fences, and many pedestrians are using the pedestrian bridge.

Pedestrian ways and carriageways are divided by robust fences.

The carriageways consists of 6 lanes

The pedestrian overpass is about 40m long and 2.8m wide.

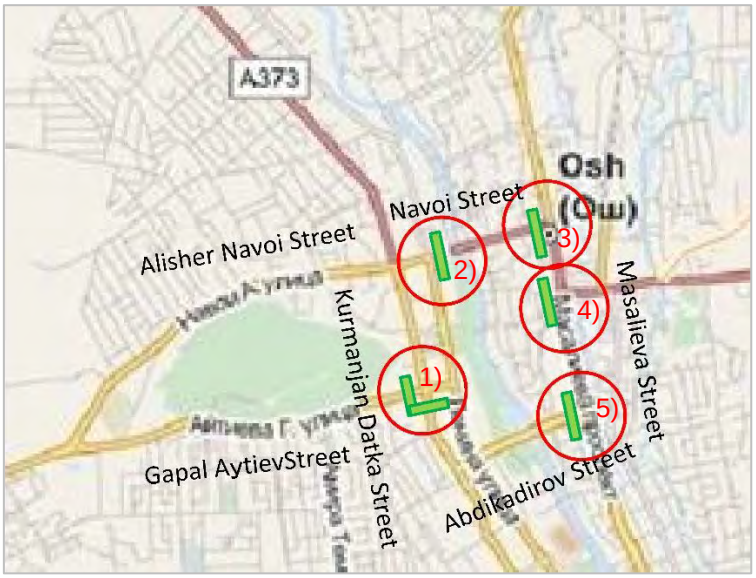
The stairs width is 2.8m, same as the pedestrian way crossing the road.

Source: JICA Survey Team

Figure 9.1-27 Pedestrian Overpass in Jalal-abad City

Osh city showed plans of developing 6 pedestrian overpasses at the roundtable, which was held on December 11. The plans are to construct pedestrian overpasses at 5 intersections in

the city center, lead by the City mayor with high priority. The Survey team has conducted an intersection survey at 3 locations of the 5 proposed intersections and a field survey at all intersections.

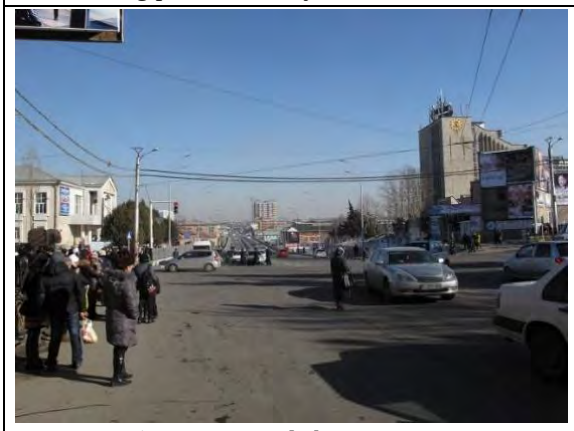


Source: JICA Survey Team based on Osh City

Figure 9.1-28 Osh City Planning Pedestrian Overpasses

1) Crossing Gapar Aytiev St.
The width of sidewalk on the right side is too narrow for installing pedestrian ways.

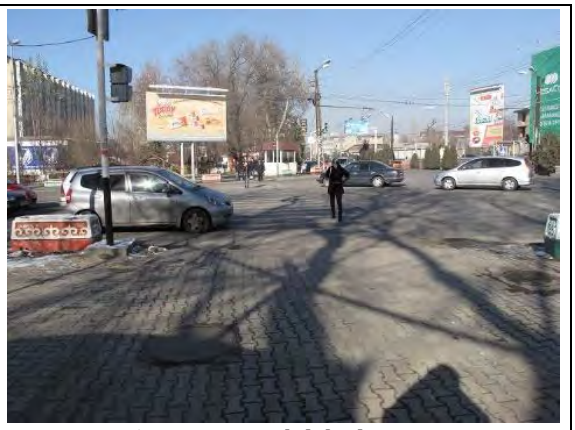
1) Crossing Kurmanjan Datka St.
The width of sidewalk on the left side is too narrow for installing pedestrian ways.



2) Crossing Alisher Navoi St.

3) Crossing Navoi St.

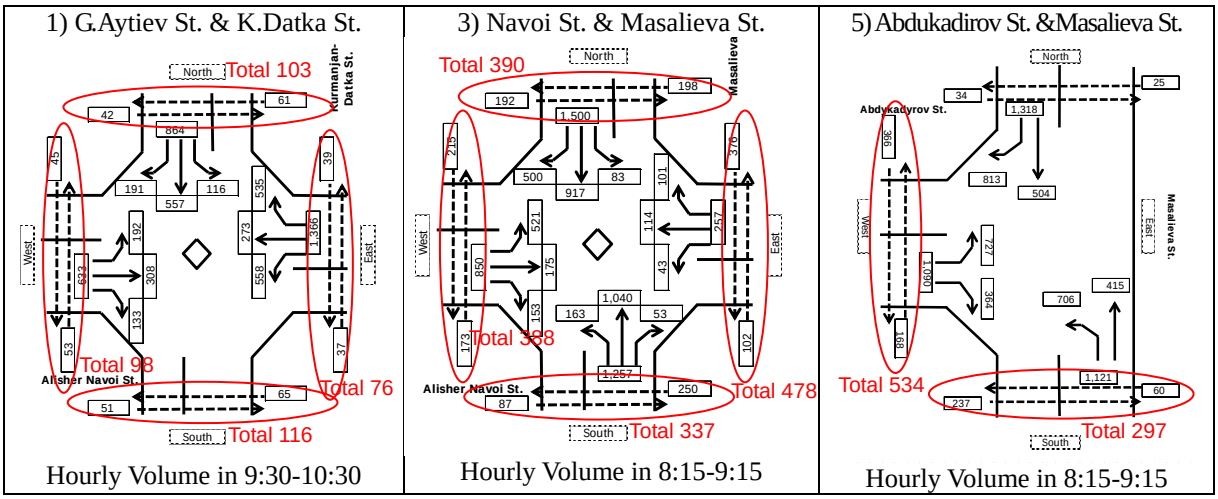
4) Crossing Monueva St.
The width of sidewalk on the left side is too narrow for installing pedestrian ways.



5) Crossing Abdukadirov St.

Source: JICA Survey Team

Figure 9.1-29 Present Conditions of Pedestrian Overpass Locations



Source: JICA Survey Team

Figure 9.1-30 Number of Pedestrians Crossing

ii) Recommendation

The JICA Survey team conducted preliminary field surveys and evaluated the availability of pedestrian walks for constructing pedestrian overpasses. With the considerations to the number of passengers crossing the street, evaluation results are shown in Table 9.1-5.

Table 9.1-5 Preliminary Evaluation of Pedestrian Overpass

No.	Name of Intersection	Land Availability	Traffic	Passenger Crossing	Evaluation
1	G.Aytiev St. & K.Datka St.	Difficult	Heavy	Heavy in every direction	Necessity is high but land acquisition may be required. Further studies shall be conducted.
2	Navoi St. & Lenin St.	Possible	Heavy	Heavy in North-South direction.	The effectiveness of constructing a pedestrian overpass at one direction shall be studied.
3	Navoi St. & Masalieva St.	Possible	Heavy	Heavy in every direction	Necessity is high. The pedestrian pass can be used for a pedestrian overpass. Four-direction pedestrian bridge shall be studied.
4	Monueva St. & Masalieva St.	Difficult	Heavy	Not many	Present needs shall be evaluated by field survey.
5	Abdukadirov St. &Masalieva St.	Possible	Heavy	Heavy in North-South direction and crossing Masalieva St. at Southern part	Necessity is high. The pedestrian pass can be used for a pedestrian overpass. A two-direction pedestrian bridge shall be studied by considering the effective method of dividing pedestrians from carriageways.

Source: JICA Survey Team

9.2 Traffic Demand Forecast

9.2.1 Socio-economic Development Framework

1) Projections of Population in the Kyrgyz and Osh City

One basic socio-economic element in the forecast of future urban traffic demand is the changes in the future population. The future traffic demand in Osh city will be influenced by the changes of future traffic generation and attraction based on the future city population. This section discusses roughly the projection of future population in Kyrgyz and Osh city in order to contrast the characteristics of the growth rate of the future population or the expansion of population size with the growth rate of GDP/GRDP and growth rate of road traffic volume in next section.

The projection of population in the Kyrgyz is created, using reference material from the International Monetary Fund (IMF) World Economic Outlook Database 2013. The IMF Report projects a population of 6.40 million by 2020 at an average growth rate of 1.39%. In view of the circumstance in the trend of recent growth rate, the IMF Report projected that growth rate in the period of 2015-2020 was 1.4%. The Survey Team recognizes that the growth rates of the population for both, Kyrgyz and Osh City, were fluctuating heavily during 2009-2012. However, the population growth rates of 3 years from 2013 to 2015 in the Kyrgyz and Osh City have been comparatively stable at 2.0%-2.1% and 1.8%-1.9% respectively, which remain almost unchanged.

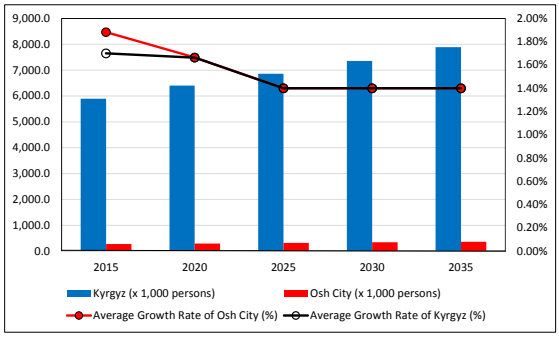
Based on the assessment of these projections, the Survey Team projected the population for Kyrgyz and Osh City from 2015 to 2035, as shown in Table 9.2-1. The population will account for 6.40 million, 6.86 million, 7.36 million and 7.89 million by 2020, 2025, 2030 and 2035 respectively.

For Osh City, population growth rates follow the same trend of Kyrgyz national population in 2020-2035, due to a similar trend of proportion to the national population in past three years in 2013-2015. The population accounts for 0.29 million by 2020, 0.32 million by 2025, 0.34 million by 2030 and 0.36 million by 2035 respectively.

Table 9.2-1 Projections of Population for the Kyrgyz Republic and Osh City

Item	Year				
	2015	2020	2025	2030	2035
Kyrgyz Population (1,000 persons)	5,895	6,402	6,863	7,357	7,887
Average Annual Growth Rate (%)	1.7*	1.4	1.4	1.4	1.4
Osh City Population (1,000 persons)	270	294	315	337	362
Average Annual Growth Rate (%)	1.8**	1.4	1.4	1.4	1.4
Proportion to National Population (%)	4.6	4.6	4.6	4.6	4.6

Notes: * Average growth rate of 5 years from 2010 to 2015, ** Average growth rate of 3 years from 2012 to 2015
Source: JICA Survey Team, IMF World Economic Outlook Database 2013



Source: JICA Survey Team

Figure 9.2-1 Projections of Population for the Kyrgyz Republic and Osh City

2) Projections of GDP in the Kyrgyz Republic

Currently, two (2) GDP projections for Kyrgyz are available, that is the IMF Report of World Economic Outlook Database of 2013 and the ADB Project of CAREC Corridor 1 (Bishkek-Torugart Road) Project 3 in 2011. The IMF report projected the average annual GDP growth rates from 2014 to 2020. The IMF Report projected the growth rate at 4.3% in 2014-2020., as indicated in Table 9.2-2.

Meanwhile, the ADB CAREC Corridor 1 report projected GDP growth rates from 2020 to 2035, based on the projection of the growth rates in 2015–2020 were sourced from the IMF Report. The average annual GDP growth rate for 2020–2035 has been projected at 5.5%, the

growth rate is higher than IMF Report with a growth rate of 4.3%. That is why service industries in the Kyrgyz will provide a major role in the national economy, in accordance with the increase of assumed GDP growth rates of 6.0%–6.5% in Central Asia during the period 2017–2036[4]. The volume of inbound goods from PRC has increased, making the Kyrgyz an important player in transporting cargo between PRC and other Central Asian countries, on one hand, and to Europe on the other.

Table 9.2-2 Existing Projection of GDP Average Growth Rates in IMF Report and ADB CAREC Project

IMF Report and ADB Project	Year			
	2015-2020	2020-2025	2025-2030	2030-2035
IMF Report of World Economic Outlook Database, 2013	4.3%	-	-	-
ADB CAREC Corridor 1 (Bishkek-Torugart Road) Project 3, 2011	4.3%	5.5%	5.5%	5.5%

Source: IMF Report and ADB Report

3) Projections of Traffic Growth Rate in Other Projects

The growth rates of future traffic volume in the study area were projected by various studies in Kyrgyz. The Survey team made a comparison among the traffic growth rate of six (6) reports. The existing study reports are as follows:

- WB National Roads Rehabilitation Project Phase 1-Updated Feasibility Study Report in 2009
- JICA Survey Planning and Preparation for Kugart River Bridge from Bishkek to Osh in 2012
- ADB Master Plan on Road and Transport Sector Development in 2012
- JICA Road Disaster Prevention Plans and Capacity Building in Kyrgyzstan in 2014
- WB OBI Feasibility Study in 2009
- JICA Preparatory Study on OBI Road in 2014

Based on the results of traffic growth rate in above-mentioned projects, Table 9.2-3 shows the projection of traffic growth rate for a five-year period between 2019 and2034 by study reports.

The WB National Roads Rehabilitation Project in 2009 projected the traffic growth rate at 10.4% in 2019, 6.8% in 2024, 5.1% in 2029 and 4.0% in 2034 respectively. The predicted growth rate is highest at 10.4% in 2019, however, after 2019, the rate decreased gradually from 6.8% to 4.0%. The JICA Survey Planning and Preparation for Kugart River Bridge from Bishkek to Osh in 2012 projected slightly lower growth rate at 3.8% for 2019 and 2024, in addition, for ADB Master Plan on Road and Transport Sector Development in 2012, a growth rate of 4.4%.was calculated by the comparison of the projected volume in 2025 and the existing volume in 2014. JICA Road Disaster Prevention Plans and Capacity Building in

[4] According to the "CAREC Corridor 1 Report" by ADB

Kyrgyzstan in 2014 projected the growth rate at 5.0%-3.7% until 2029. The growth rate was seen as an average value by comparison to another project. The JICA Preparatory Study on OBI Road in 2014 projected the traffic growth rate at 5.0% in 2019, 4.0% in 2024, 3.3% in 2029 and 2.8% in 2034 respectively, as the bases for 2014. The growth rate was similar to the JICA Road Disaster Prevention Plans and Capacity Building project.

Table 9.2-3 Existing Projection of Traffic Growth Rate

Name of Project	2019	2024	2029	2034	Remarks
WB National Roads Rehabilitation Project Phase 1-Updated Feasibility Study Report in 2009	10.4%	6.8%	5.1%	4.0%	Projection as the basis for 2014
JICA Survey Planning and Preparation for Kugart River Bridge from Bishkek to Osh in 2012	3.8%	3.8%	-	-	
ADB Master Plan on Road and Transport Sector Development in 2012	4.4%	4.4%	-	-	Growth rate between projected volume in 2025 and existing volume in 2014
JICA Road Disaster Prevention Plans and Capacity Building in Kyrgyzstan in 2014	5.0%	4.0%	3.7%	-	Projection as the basis for 2014
WB OBI Feasibility Study in 2009	7.0%	7.0%	7.0%		2008
JICA Preparatory Study on OBI Road in 2014	5.0%	4.0%	3.3%	2.8%	Projection as the basis for 2014

Source: WB/JICA/ADB Reports

4) Projection of Traffic Growth Rate for the Study during 2015-2035

Based on the assessment of above-mentioned projections of GDPs and traffic growth rates in other projects, the Survey team projected traffic growth rates for this study until 2035. Taking into consideration regionality and consistency, the Survey team decided to apply the future traffic volume growth ratio of OBI FS 2014 as a middle scenario. High scenario is sustainable growth for 5% in the future, whereas low scenario applies 4.2% of IMF economic growth until 2020, then 1 % less than the middle scenario. The assumed traffic growth rates by each five-year period during 2015-2035 are shown in Table 9.2-4.

Table 9.2-4 Assumed Traffic Growth Rate for Study during 2015-2035

Scenario	2015-2020	2020-2025	2025-2030	2030-2035	Note
High Scenario Case	5.0%	5.0%	5.0%	5.0%	Set upper limit at 5.0% by comparison to average traffic growth rate at 4.0%
Middle Scenario Case	5.0%	4.0%	3.3%	2.8%	JICA Preparatory Study on OBI Road in 2014
Low Scenario Case	4.3%	3.0%	2.3%	1.8%	2015-2020 at 4.3% is derived from IMF projected GDP, after 2020, 1 % lower than the middle scenario case

Source: JICA Survey Team

5) Seasonal Fluctuation

To convert traffic survey data to Annual Average Daily Traffic (AADT), the seasonal conversion ratio is required. The Survey team found out that there is no recent seasonal traffic volume record in the Kyrgyz. Feasibility Study for OSI Road rehabilitation[5] applied seasonal conversion ratio made from the 2001 Study survey, at the Km 21 Osh-Irkeshtam Road Karatai station (which had complete counts) together with some assumptions to fulfill blank data. Table 9.2-5 shows the conversion ratio. The preparatory survey for OSI Road[6], the most recently conducted study, also applied this conversion ratio.

Table 9.2-5 Seasonal Conversion Ratio

January	February	March	April	May	June
1.71	1.71	1.18	0.91	0.75	0.80
July	**August**	**September**	**October**	**November**	**December**
0.80	0.80	0.80	0.89	1.71	1.71

Source: National Roads Rehabilitation (Osh- Isfana) Project (WB, 2009)

On the other hand, above mentioned studies are targeting intercity trunk roads, whereas this survey targets a rather urban area. In general, urban traffic is stable in terms of seasonal variation, however, Osh city and vicinity are major hubs for agriculture products and logistics. Taking into consideration the above conditions, commodity statistics are considered. Table 9.2-6 shows seasonal commodity statistics of Osh city and Osh Oblast. 1.13 is assumed to be the conversion ratio of this study since it is modest and reasonable.

Table 9.2-6 Seasonal Commodity Statistics

(Unit: Ton)

	1-3	4-6	7-9	10-12	Total
Osh City	126.0	13.03	120.0	118.0	497.0
Osh Oblast	654.3	581.2	693.7	537.7	2,466.9
Total	780.3	714.2	813.7	655.7	2,963.9
Conversion Ratio	0.95	1.04	0.91	1.13	-

Source: National Statistical Committee in 2014

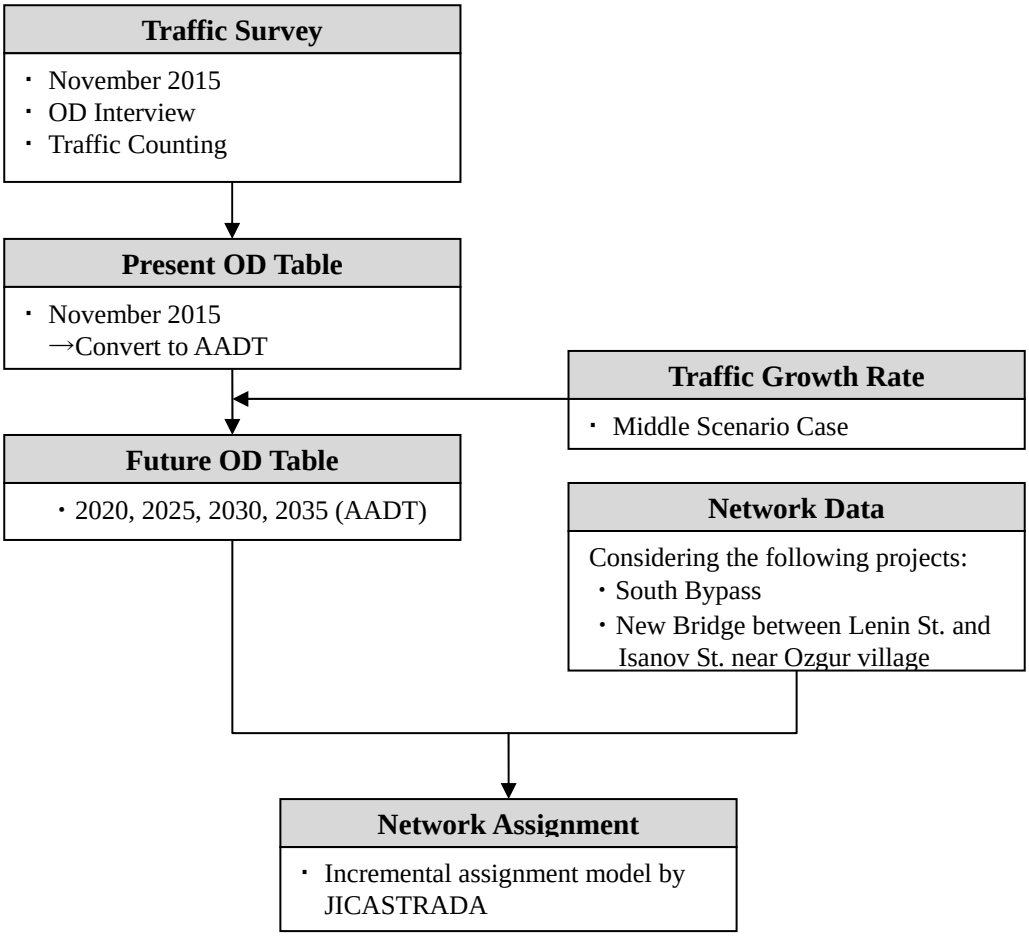
[5] National Roads Rehabilitation (Osh- Isfana) Project (NRRP) – World Bank PPA Q6240, Consultancy Services for Updating of Feasibility Studies, Detailed Technical Designs, Bidding Documents and Procurement Assistance for the Road From Osh to Isfana in the Kyrgyz Republic, 2009

[6] Kyrgyz Republic Preparatory Study on International Trunk Road Improvement Project in Kyrgyzstan, JICA, 2014

9.2.2 Procedure and Assumptions

1) Procedure

Figure 9.2-2 shows the procedure of future traffic demand forecast.



Source: JICA Survey Team

Figure 9.2-2 Procedure of Network Assignment for Traffic Demand Forecast

2) Explanation of the Components of Traffic Demand Forecast

The elements used in the traffic demand forecast are explained below:

i) Vehicle Classification

Vehicles are classified as shown in Table 9.2-7.

Table 9.2-7 Vehicle Classification for Traffic Demand Forecast

	Classification
1	Sedan/Taxi/Van/Pickup
2	Light Truck (<2.0t, L:<5m)
3	Mid-size Truck (<14.0t, L:<9m)
4	Heavy Truck
5	Bus (including Marshrutka and Trolley Bus)

Source: JICA Survey Team

ii) Passenger Car Equivalent (PCE)

Traffic volume is expressed in the form of Passenger Car Unit (PCU) and a number of vehicles. The passenger car equivalents (PCE) used in the traffic demand forecast are shown in Table 9.2-8.

Table 9.2-8 PCE (Passenger Car Equivalent)

Categories	1. Sedan	2. Light Truck	3. Mid-size Truck	4. Heavy Truck	5. Bus
PCE	1.0	1.3	1.8	2.7	1.4

Source: SNiP 2.05.02-85 Automobile Roads (Kyrgyz Republic Construction Standards)

iii) Seasonal Conversion Ratio

The seasonal conversion ratio to convert the traffic survey data to Annual Average Daily Traffic (AADT) is 1.13 as mentioned in "9.2.1 Socioeconomic Development Framework."

iv) Traffic Analysis Zones

The survey area is divided into the traffic analysis zones, which consist of 7 zones outside Osh city and 12 zones inside Osh city as shown in Table 9.2-10 and Figure 9.2-3.

v) Future OD Table

Future OD tables were estimated using the traffic growth rate of the middle scenario case as shown in Table 9.2-9 (all scenarios are shown in Table 9.2-4).

Table 9.2-9 Assumed Traffic Growth Rate for Traffic Demand Forecast

Scenario	2015-2020	2020-2025	2025-2030	2030-2035	Note
Middle Scenario Case	5.0%	4.0%	3.3%	2.8%	JICA Preparatory Study on OBI Road in 2014

Source: JICA Survey Team

Table 9.2-10 Traffic Analysis Zones

Zone No.	Area	Zone Name	Note
1	Outside Osh City (Cordon Line)	OSI Road	Osh Oblast [Alay, Chong-Alay], China, Tajikistan
2		BO Road	Osh Oblast [Karasuu (along A370), Uzgen, Kara-Kuldja], Bishkek City, Chui Oblast, Issyk-Kul Oblast, Jalal-abad Oblast, Naryn Oblast, Talas Oblast, Kazakhstan, Russia
3		Osh-Karasuu Market (M41) Road	Osh Oblast [Karasuu (around Karasuu market, along M41 except OSI Road)]
4		Airport Access Road	Osh Oblast [Karasuu (around the airport)]
5		A373 Road	Osh Oblast [Karasuu (around A373)], Uzbekistan
6		Kokum Bii St.	Osh Oblast [Karasuu (along the road to Aravan), Aravan]
7		OBI Road	Osh Oblast [Karasuu (along OBI Road), Nookat Pass], Batken Oblast, Uzbekistan

Zone No.	Area	Zone Name	Note
8	Inside Osh City	Turan	The boundary of the traffic analysis zones inside Osh City follows the boundary of the territorial council as described in "3.3.1 Administrative division of Osh city." Japalak (No.19) is the representative of 11 suburban villages of Osh City.
9		Dostuk	
10		Sulayman Too	
11		Ak-Tilek	
12		Kerme Too	
13		Manas Ata	
14		Alymbek Datka	
15		Ak-Buura	
16		Amir Temur	
17		Kurmanjan Datka	
18		Jibek-jolu	
19		Japalak	

Source: JICA Survey Team

vi) Road Network for Traffic Assignment

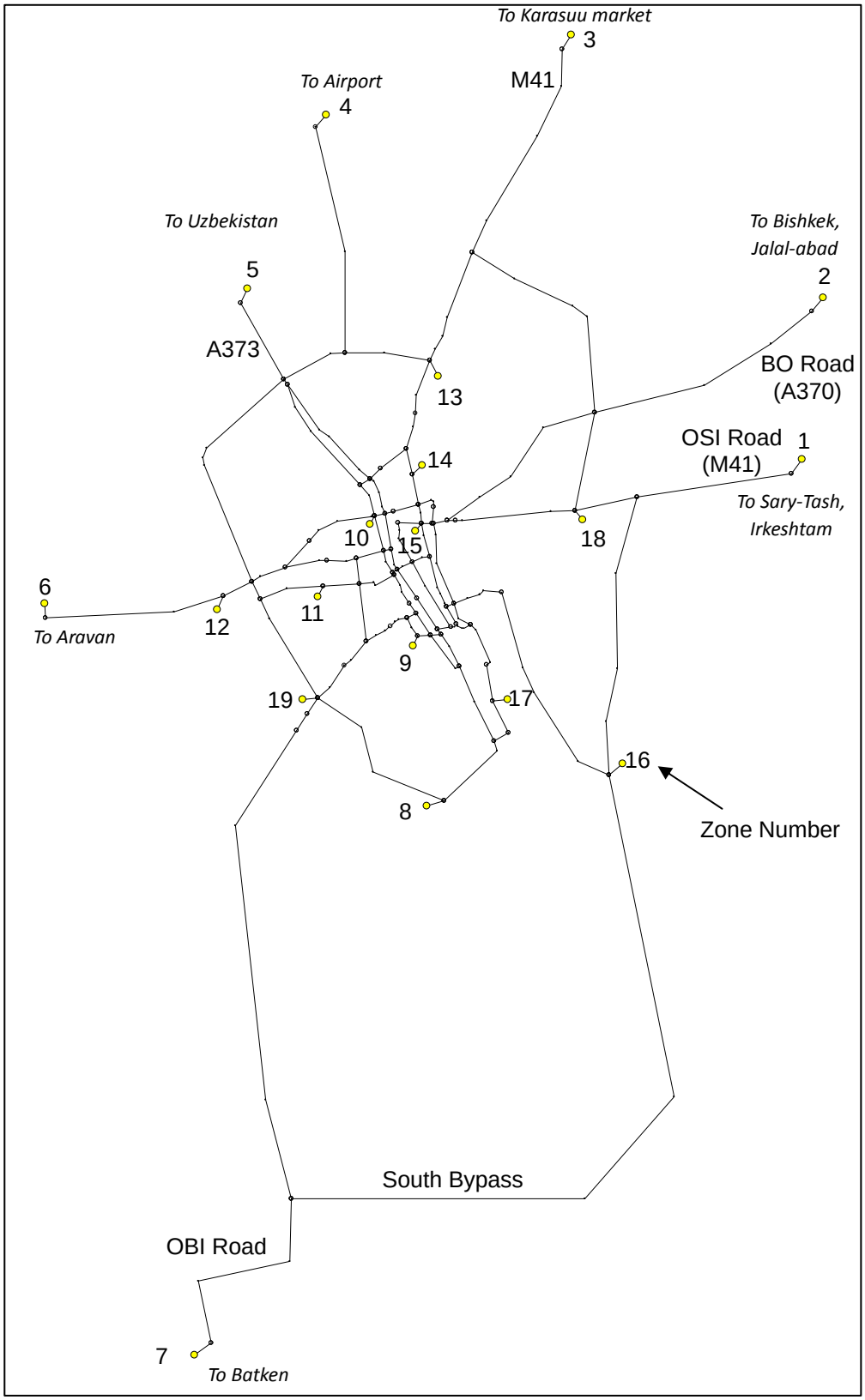
As a future road network, present implementing projects are taken in. Ongoing projects are shown in Table 9.2-11.

Table 9.2-11 Main Assumption of Future Road Network

No.	Project	Organization	Status	Assumed Opening Year
1	Construction of South Bypass Road of Osh City	MOTC	Ongoing: Conducting design and cost estimation by Road Design Institute	2020
2	Bridge Construction between Lenin St. and Isanov St. near Ozgur village	Osh City	Ongoing: Under bidding process	2020

Source: JICA Survey Team

Figure 9.2-3 shows the road network for traffic assignment.



Source: JICA Survey Team

Figure 9.2-3 Road Network for Traffic Assignment

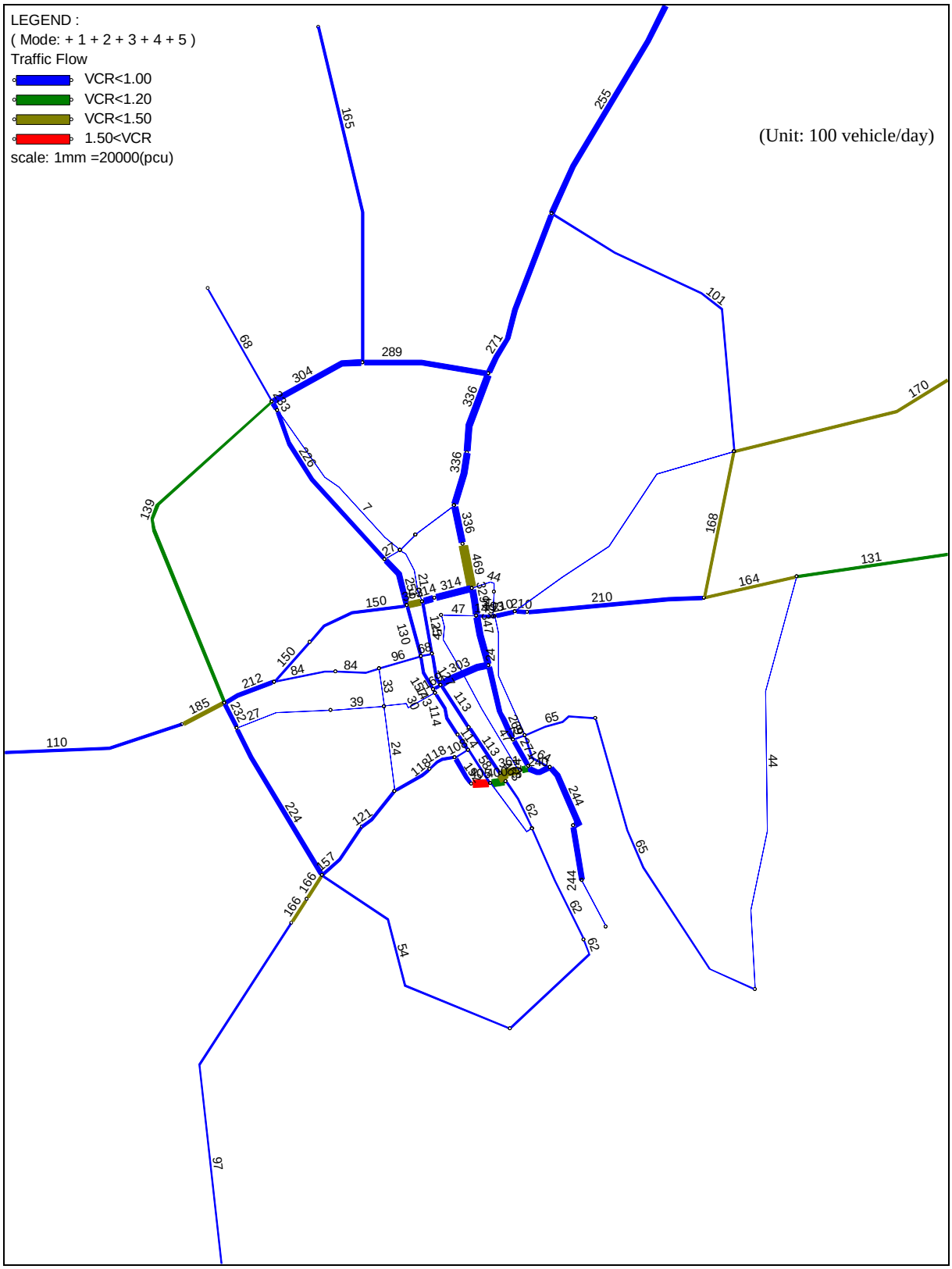
3) Results of Traffic Demand Forecast

The results of the traffic demand forecast are shown in Figure 9.2-4 to Figure 9.2-8, which indicate the number of vehicles per day and the VCR (Volume Capacity Ratio) on each link. Table 9.2-12 summarizes the comparison of traffic indicators estimated in each target year.

Table 9.2-12 Traffic Indicators in Target Year

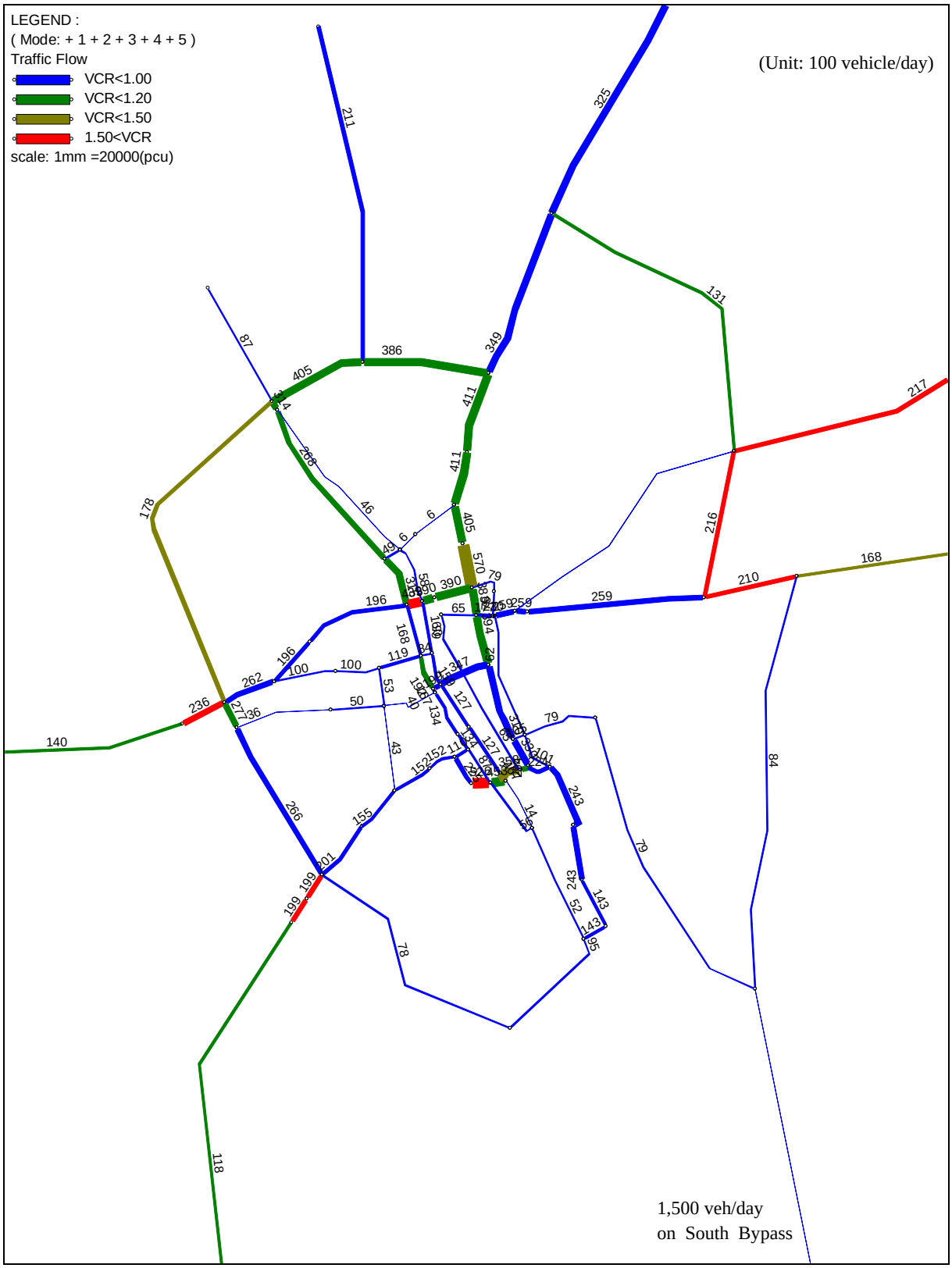
Item	Unit	Vehicle Type	Year				
			2015	2020	2025	2030	2035
Vehicle-Km Total	PCU*km/day	Sedan	2,123,884	2,737,717	3,372,389	3,993,107	4,591,961
		LT	216,849	279,483	345,847	409,973	471,484
		MT	86,191	110,832	136,608	161,182	186,653
		HT	117,267	150,418	182,901	216,584	248,560
		Bus	114,225	146,944	180,883	213,830	249,317
		Total	2,658,416	3,425,394	4,218,628	4,994,675	5,747,975
Capacity-Km Total	PCU*km/day	Total	3,217,700	3,491,700	3,491,700	3,491,700	3,491,700
Ave. VCR	-	Total	0.83	0.98	1.21	1.43	1.65
Vehicle-hours Total (Average)	PCU*hour/day	Sedan	34,297	48,738	67,810	89,053	113,814
		LT	4,629	6,575	9,172	12,052	15,387
		MT	1,851	2,600	3,598	4,748	6,077
		HT	1,980	2,798	3,787	4,927	6,200
		Bus	2,614	3,628	5,022	6,641	8,528
		Total	45,370	64,339	89,389	117,421	150,007
Ave. Travel Speed	km/hour	Total	58.6	53.2	47.2	42.5	38.3
Travel Time Cost	mil USD/year	Total	75.1	106.3	147.7	194.2	248.3
Vehicle Operating Cost	mil USD/year	Total	249.7	342.7	451.1	568.1	705.1

Note: LT=Light Truck, MT=Mid-size Truck, HT=Heavy Truck
Source: JICA Survey Team



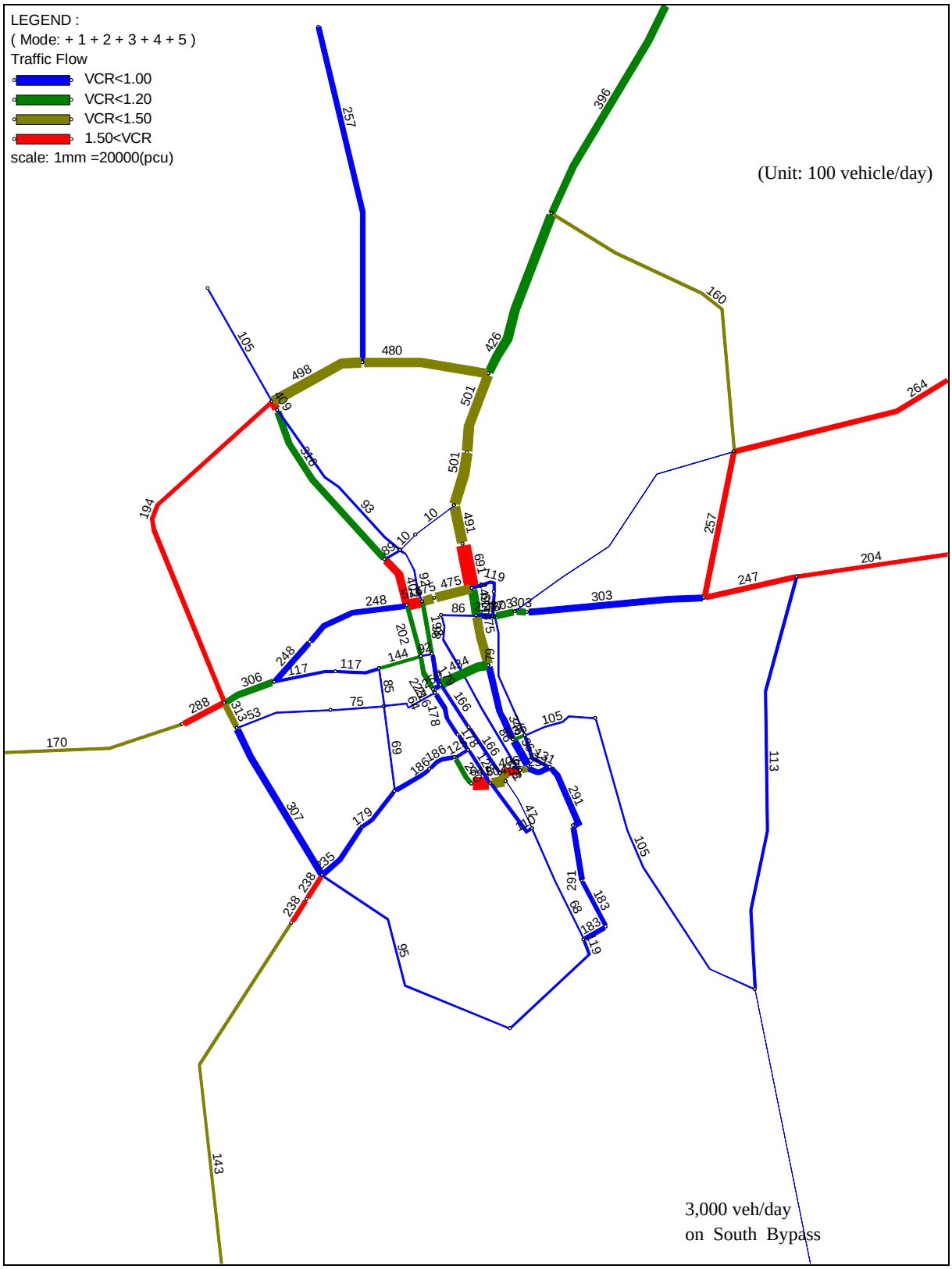
Source: JICA Survey Team

Figure 9.2-4 Traffic Demand in 2015



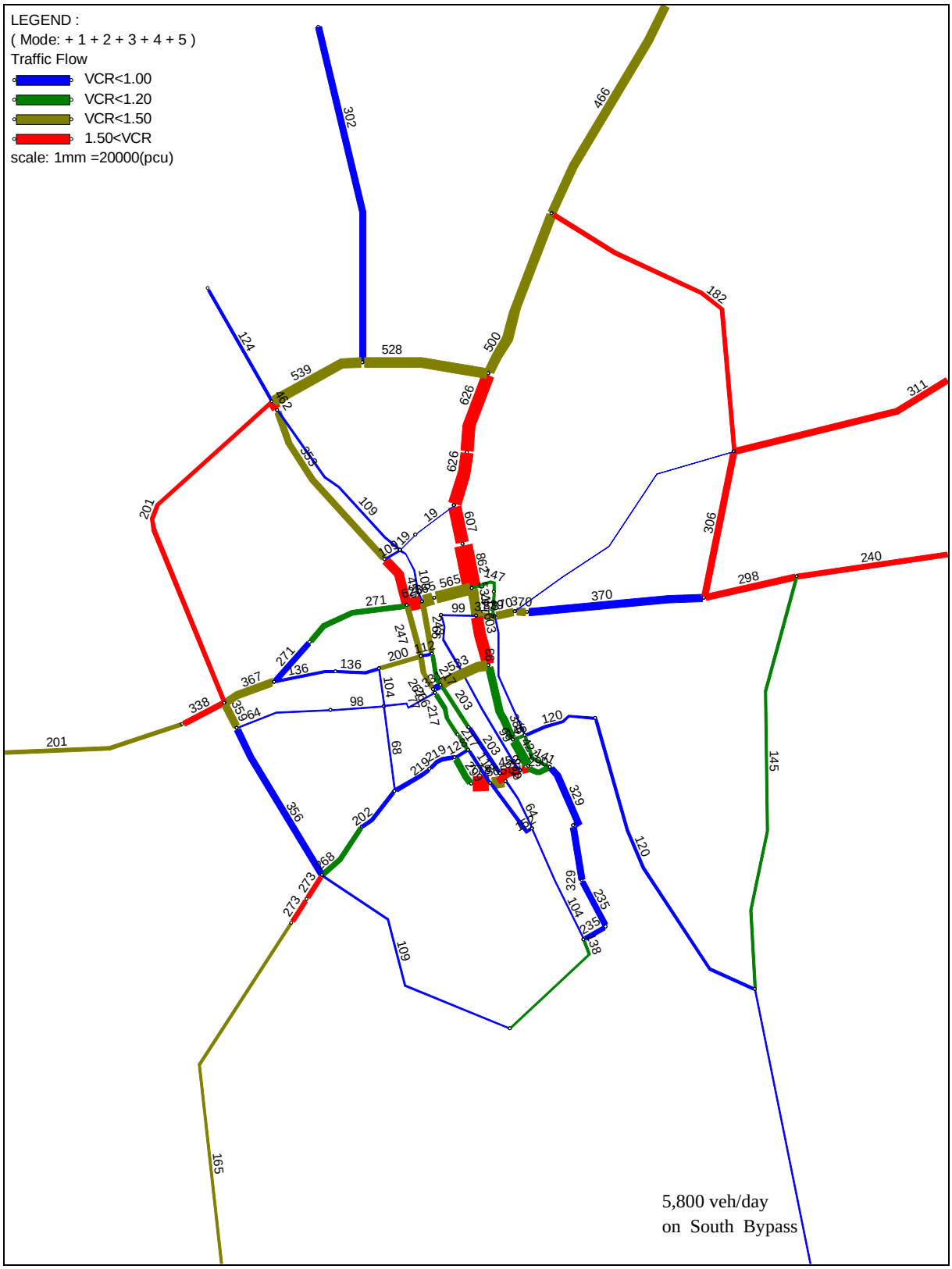
Source: JICA Survey Team

Figure 9.2-5 Traffic Demand in 2020



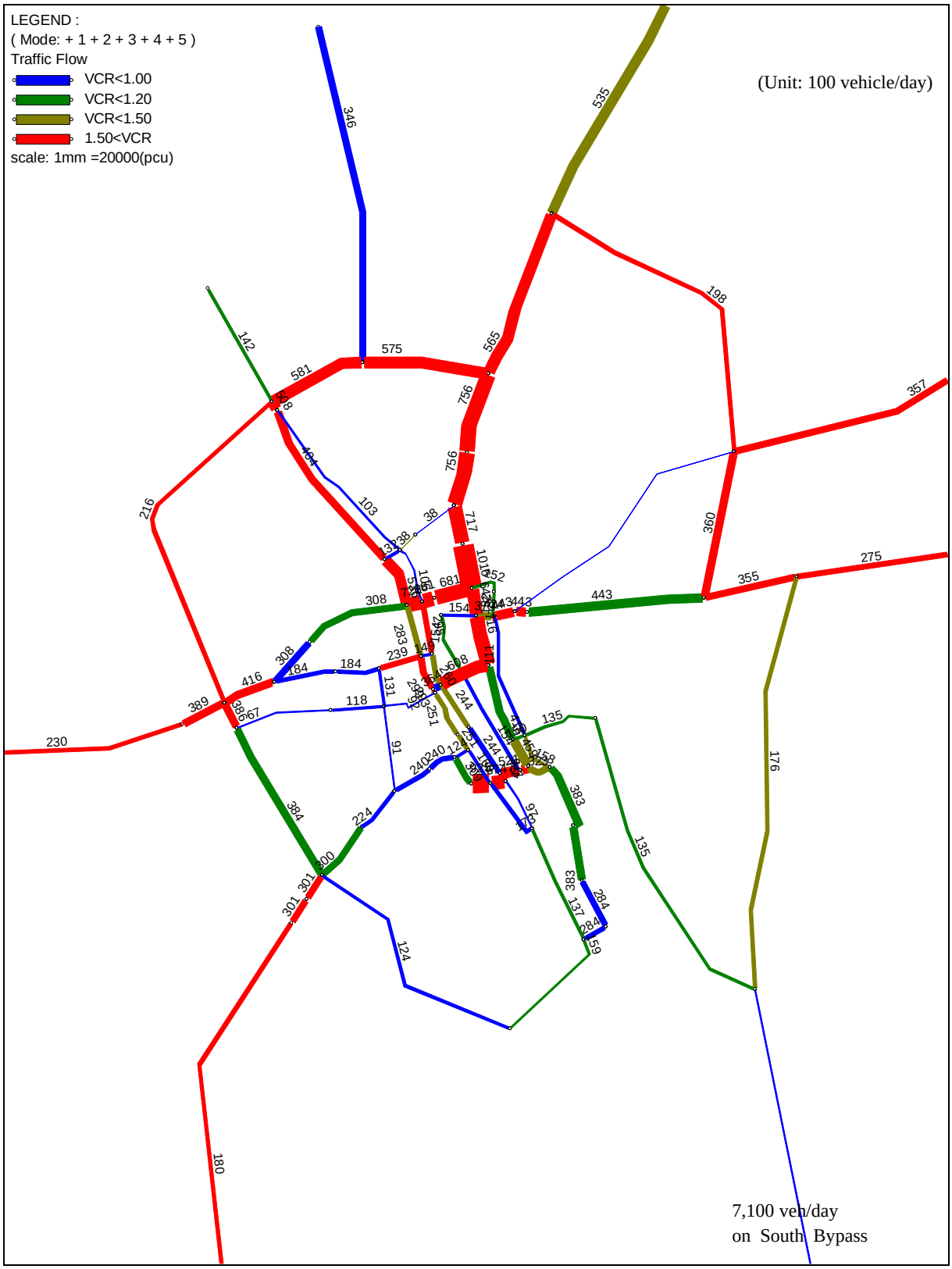
Source: JICA Survey Team

Figure 9.2-6 Traffic Demand in 2025



Source: JICA Survey Team

Figure 9.2-7 Traffic Demand in 2030



Source: JICA Survey Team

Figure 9.2-8 Traffic Demand in 2035

9.2.3 Project to Facilitate Future Traffic Demand

The Survey team considered necessary projects to facilitate future traffic upon the results of the traffic demand survey, including identified projects, which are shown in Table 9.1-1.;

By 2020 (Urgent Projects)

- Widening Nurmatov St. [identified]
- Widening BO Road
- Extension of the South Bypass to connect OSI and BO Roads

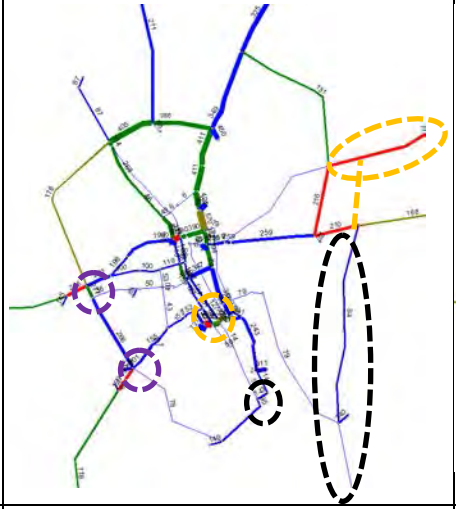
By 2030 (Short-term Projects)

- Widening North East part of ring road [identified]
- Widening North West part of ring road (Osmonova St.)
- Widening OSI Road

By 2035 (Long-term Projects)

- New road connecting North and City Center [identified]
- Widening Osh-Aravan Road
- Widening OBI Road

Table 9.2-13 Project to Facilitate Future Traffic Demand

	2020	2025	2030	2035
Future Demand Forecast				
Analysis	[Developed Network] • South Bypass • New Ozgul village Bridge [Required Improvement] • Widening BO Road • Extension South Bypass to connect OSI and BO Roads • Widening Nurmatov St. [Required Traffic Management] • Improvement of Intersections • Parking Improvement	[Developed Network] Nothing [Required Improvement] • Widening OSI Road • Widening North West part of ring road (Osmonova St.)	[Developed Network] Nothing [Required Improvement] • Widening North East part of ring road [Required Traffic Management] • Improvement of transport operation and signal control on Masalieva St.	[Developed Network] Nothing [Required Improvement] • New road connecting North and City Center. • Widening Osh-Aravan Road • Widening OBI Road

Source: JICA Survey Team

9.2.4 Volume Capacity Analysis on Ak-Buura River

The Ak-Buura River is the critical terrain of Osh city especially for the traffic passing international corridors. Based on the traffic demand forecast, the capacity of bridges crossing the river is studied.

As an assumption of this study, ongoing projects, South Bypass of Osh City (2 lanes) and Ozgur village Bridge (4 lanes), are assumed to be developed by 2020. Nurmatov St. Bridge is also regarded to be widened to 4 lanes by 2020.

Table 9.2-14 shows further required bridge capacities by scenario as follows;

- The middle scenario requires one 4-lane bridge in 2030 and two 4-lane bridges in 2035,
- The high scenario requires two 4-lane bridges in 2030 and four 4-lane bridges in 2035, and
- The low scenario requires one 4-lane bridge in 2035.

Uch Kocho St. Bridge (4 lanes), the widening of the South Bypass Bridge (2 -> 4 lanes) and the widening of the bridge on the North West part of Ring Road (Kasymbekova St. Bridge) (4 lanes -> 6 lanes) are included in remaining candidate projects. By those projects, 86,000 pcu/day can be increased, therefore the low and middle scenario can be maintained theoretically. To facilitate the high scenario in 2035, further bridges such as those planned in the General Plan are shall be studied.

Table 9.2-14 Required Capacity of Bridges on Ak-Buura River

(Unit: 1,000 pcu/day)

		2015	2020	2025	2030	2035
Capacity upon Design Standard		**134.0**	**214.0**	**214.0**	**214.0**	**214.0**
High Scenario	Traffic Volume	135.2	175.6	225.3	288.4	371.8
	VCR	1.01	0.82	1.05	1.35	1.74
	Required Capacity (Lanes)	-	-	-	80.0 (8)	160.0 (16)
Middle Scenario	Traffic Volume	135.2	175.6	214.8	253.4	293.8
	VCR	1.01	0.82	1.00	1.18	1.37
	Required Capacity (Lanes)	-	-	-	40.0 (4)	80.0 (8)
Low Scenario	Traffic Volume	135.2	169.0	196.6	220.5	243.2
	VCR	1.01	0.79	0.92	1.03	1.14
	Required Capacity (Lanes)	-	-	-	-	40.0 (4)

Source: JICA Survey Team

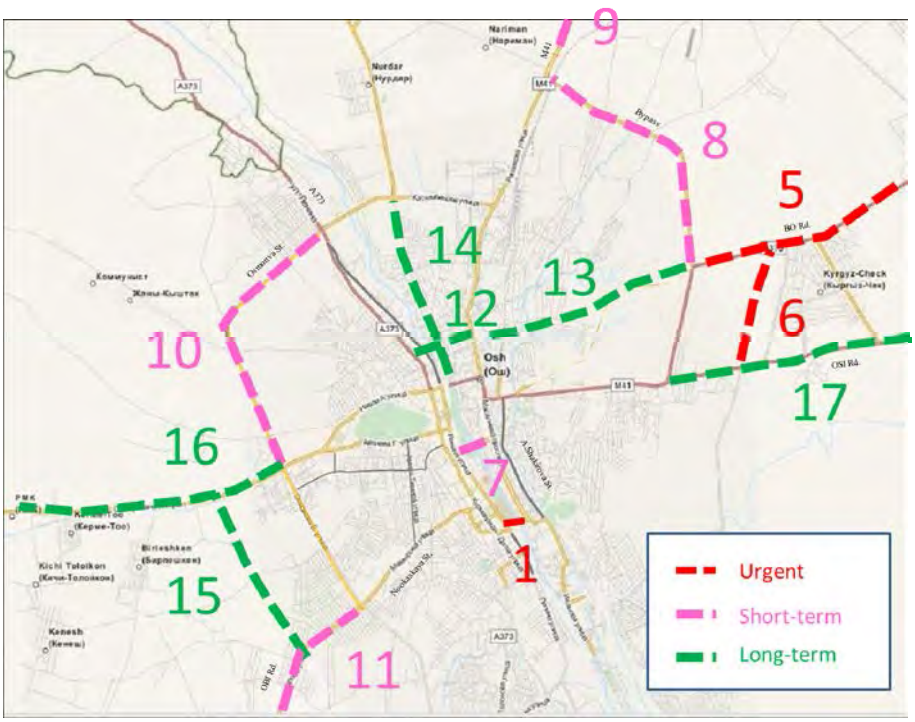
9.3 Priority of Road and Bridge Project

The Survey team prioritizes identified road and bridge projects taking into consideration the following points; 1) Urgency, 2) Relevance, 3) Effectiveness, 4) Consensus among concerns, and 5) Social and environmental consideration. Projects are categorized into Urgent, Short-term and Long-term plans as shown in Table 9.3-1 and Figure 9.3-1. The criteria for the evaluation are shown in Table 9.3-2.

Table 9.3-1 Priority of Road and Bridge Projects

Priority	Project	Organization	Evaluation				
			Urgency	Relevance	Effectiveness	Consensus	Social and Environment
Urgent	1) Reconstruction of Nurmatov St. Bridge	Osh City/ MOTC	A	A	A	A	B
Urgent	2) Improvement of Road Marking and Sign	Minister of Internal Affairs	A	A	B	A	A
Urgent	3) Enhancement of Traffic Management Capacity	Osh City	A	A	B	A	A
Urgent	4) Improvement of Road Safety	Osh City	A	A	A	A	A
Urgent	5) Widening BO Road	MOTC	A	A	A	B	B
Urgent	6) Extension South Bypass to connect OSI and BO Roads (To be included in the South Bypass Project)	MOTC	A	A	A	B	C
Short-term	7) Rehabilitation of Abdukadirov St. Bridge	Osh City	B	A	A	A	A
Short-term	8) Improvement/ Widening of Undeveloped Sections of Ring Road	MOTC	B	A	A	A	B
Short-term	9) Improvement of Osh- Karasuu Road (M41)	MOTC	B	A	A	B	A
Short-term	10) Widening North West part of Ring Road (Osmonova St.)	MOTC	B	A	A	B	B
Short-term	11) Widening OSI Road	MOTC	B	A	A	B	B
Long-term	12) Construction of New Uch Kocho St. Bridge (4 lanes)	Osh City	A	A	B	A	C
Long-term	13) Construction/Upgrading of access road (A370) between BO Road to city center	Osh City	B	A	A	B	B
Long-term	14) Construction/Upgrading of Akburinskaya St. Extension to Osh Airport Access Road	Osh City	B	A	A	B	B
Long-term	15) Construction New road; to connect OBI Road to Osh- Aravan Road to detour heavy vehicles from Ring Road (Osmonova St.)	Osh City	B	A	B	B	B
Long-term	16) Widening Osh-Aravan Road	MOTC	C	A	A	C	C
Long-term	17) Widening OBI Road	MOTC	C	A	A	C	C

Note) A: High, B: Middle, C: Low
Source: JICA Survey Team



Source: JICA Survey Team

Figure 9.3-1 Location of Road and Bridge Projects

Table 9.3-2 Criteria of Priority of Road and Bridge Projects

Index	Rank	Description
1) Urgency	A	Countermeasures of present serious transport problems or necessary projects until 2020 indicated by traffic demand forecast
	B	Necessary projects until 2030 indicated by traffic demand forecast
	C	Necessary projects until 2035 indicated by traffic demand forecast
2) Relevance	A	Project corresponding to regional requirements and transport problem will be cleared obviously
	B	Project corresponding to regional requirements and transport problem will be cleared
	C	Project is not corresponding to regional requirements or effects are low
3) Effectiveness	A	Critical effects are foreseen
	B	Certain effects are foreseen
	C	Effects are foreseen
4) Consensus	A	Publicized and confirmed consent
	B	Assent by concerns
	C	Consensus building
5) Social and Environment	A	The project can be conducted within Right-of-way (ROW). Effects on the environment is none or pretty low.
	B	The project requires small land acquisition such as road widening, but without huge land acquisition and resettlements. Effects on the environment are low.
	C	The project requires huge land acquisition such as now road construction. Effects on the environment are tremendous.

Source: JICA Survey Team

9.4 Project Implementation Plan

Bridge projects are rather big projects and advanced technologies are required, therefore, bridge projects are assumed to be conducted by international/ bilateral donors' assistance. In this regards, project implementation plans for bridge projects are considered.

9.4.1 Reconstruction of Nurmatov St. Bridge

Reconstruction schedule of Nurmatov St. Bridge is considered as shown in the following figure. Creating the outline design takes about 9 months and the detailed design takes about a further 9 months. During the design period, bidding documents are prepared and bidding for construction works is conducted. The construction period is assumed to be 2 years and 4 months, during the construction period, a temporary bridge is constructed or construction management is considered in order not to close the traffic during construction.

	1st Year				2nd Year				3rd Year				4th Year				5th Year			
1) Application & Evaluation																				
2) Outline Design																				
3) Detailed Design																				
4) Construction																				

Source: JICA Survey Team

Figure 9.4-1 Project Implementation Plan for Nurmatov Bridge

9.4.2 New Construction on South Bypass of Osh City

MOTC strictly intends to conduct the South bypass project by its initiative and ordered the Road Design Institute (DI) to conduct the design of the South bypass. DI is conducting design with its best efforts under the technical constraints of Kyrgyz, however, if MOTC considers utilizing international experience and technologies on this project, a feasibility study at international standard is essential. Following is a project implementation plan for the South bypass in the case the project is conducted by international donors, with the assumption of formulating the project in two packages, namely the road construction and the bridge construction.

	1st Year				2nd Year				3rd Year				4th Year				5th Year			
1) Application & Evaluation																				
2) Feasibility Study of South Bypass																				
3) Outline Design of Bridge																				
4) Detailed Design of Bridge																				
5) Construction of Bridge																				
6) Outline Design of Road																				

	1st Year				2nd Year				3rd Year				4th Year				5th Year			
7) Detailed Design of Road																				
8) Construction of Road																				

Source: JICA Survey Team

Figure 9.4-2 Project Implementation Plan for South Bypass of Osh City by International Donoors

CHAPTER 10 STUDY ON FUTURE ASSISTANCE FOR OSH CITY AND VICINITY

10.1 Basic Policy of Japan

Japan's ODA prioritizes two main fields, one is improving the management of transport infrastructure and the correction of disparities between urban and rural area, and the other one is the reconstruction of social infrastructure. JICA has the policy to support Kyrgyz in fostering economic growth and poverty reduction by agri-business promotions and transport infrastructure developments in accordance with Japan's ODA policy and analyzing the country's issues. The agri-business promotion targets on the enhancement of exporting agriculture and agriculture-related products, whereas the transport infrastructure developments target on increasing the competitiveness of exports by infrastructure development. In the transport sector, Japan has supported rehabilitation and upgrading of international corridors and airports by yen loans, in the meantime, reconstructions of old bridges and timprovements of road maintenance capacity by providing equipment have been conducted as grant projects. Japan has been providing the following support;

- Support MOTC in terms of capacity developments in policy making, planning, and technology improvement, and
- Infrastructure developments on road networks and logistics.

Table 10.1-1 Support Results in Road Traffic Field by JICA

Field	Project
Improvement of Equipment for Road Maintenance	• Rehabilitation of Bishkek-Osh Road (Yen Loan) • Reconstruction of bridges in Chui Oblast (Grant) • Reconstruction of bridge on Kugart River in Jalal-abad Oblast (Grant) • Special assistance for project sustainability on Bishkek-Osh Road rehabilitation project (SAPS) • Special assistance for project sustainability on Bishkek-Osh Road rehabilitation project phase 2 (SAPS)
Capacity Development for Road Maintenance	• Improvement of the equipment for road maintenance in Naryn Oblast (Grant) • Improvement of the equipment for road maintenance in Chui and Issyk-Kul Oblasts (Grant) • Improvement of the equipment for road maintenance in Osh, Jalal-abad and Talas Oblasts (Grant)
Urban Transportation Improvement	• Capacity development of road maintenance (Technical Cooperation) • Technical assistance roller compacted concrete pavement (Technical Assistance) • Capacity development for bridge and tunnel maintenance (Technical Cooperation)
Transport and Traffic Policy	• The study on improvement of urban transportation in Bishkek city (Technical Cooperation)
Road Administration	• Road administration adviser (Technical Cooperation)

Source: Country Analytical Paper for the Kyrgyz Republic (JICA, Revision in Nov. 2014), Edited by Survey Team

10.2 Study on Direction of Future Cooperation

1) Conformity to the Basic Policy of Japan

Among the projects identified in this survey, following projects conform to the basic policy of Japan's ODA.

a) Reconstruction of Nurmatov St. Bridge
b) Improvement of Road Markings and Signs
c) Construction of the South Bypass Road of Osh City

Project a) is the bridge reconstruction project of an old bridge, which will allow heavy vehicle pass on Ak-Buura River in the City. This project includes widening adjacent roads and intersection improvement. Even during the construction period, heavy vehicles shall pass through this section because this route is the only route for heavy vehicles to go through the city. Therefore, a well-designed construction plan and traffic management during the construction period are important, in order to facilitate the traffic during the reconstruction works. The bridge is about 60 years old and deteriorated severely; therefore, the reconstruction is urgently required.

Project b) is a capacity enhancement project by providing road marking machines and road sign installation equipment for CMOD-Osh, which is in charge of small-scale road pavement works on Osh city roads nominated by the Osh City Road Department. Required machines and equipment for CMOD-Osh are too small for formulating a project; therefore, the JICA Survey team consulted with CMOD head office and confirmed the necessity of those machines and equipment for other cities and regions. It is considered to provide the same type of machines and equipment to CMOD directly and to deliver to the necessary department nationwide. The counterpart is assumed to be the Ministry of Internal Affairs. This project invests a rather small amount; however, it is expected to yield in high improvement on traffic safety and traffic smoothness by utilizing existing infrastructure. It should be noted that there is a discussion on the reformation of the police organization; therefore, before conducting the project, continuity of the role of CMOD shall be confirmed.

Project c) is a design conductted by the Road Design Institute and the Government of Kyrgyz, who are taking the initiative to promote the project. The target area is precipitous terrain and requires proper treatment on cutting slopes. Furthermore, the bridge design in Kyrgyz is technically restricted and may not use the optimized location of piers in the river in terms of water control. Those issues will be improved, if the Kyrgyz requests supports from donor agencies. In order to take the assistance from donor agencies, an international standard feasibility study is necessary.

2) Urban Transportation Improvement

In the view of encouraging business, transport improvement in the urban area is very effective, since economic resources concentrate in the urban area. In addition, traffic safety improvement is an urgent issue. From a different perspective, projects in the urban area are highly visible, so that they appeal to many people. In this regards, the following projects are recommended;

d) Enhancement of the Traffic Management Capacity
e) Road Safety Improvements

3) Direction of Future Cooperation

Followings are concluded as suitable projects for requesting support from donors;

1) Reconstruction of Nurmatov St. Bridge,

2) Improvement of Road Markings and Signs,

3) Enhancement of Traffic Management Capacity, and

4) Improvement of Road Safety.

Appendix

1. Traffic Survey Sheets

A : Roadside Traffic Count Survey

B-1 : Intersection Survey/ Traffic Count in City

B-2 : Intersection Survey/ NMT Count

B-3 : Intersection Survey/ Maximum Queue Length

2. Construction Unit Prices by Bridge Types

3. Cost Estimations

4. Joint Reconnaissance on the Nurmatov St. Bridge

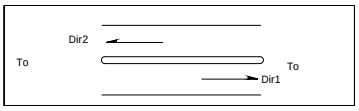
1. Traffic Survey Sheets

APPENDIX A: Roadside Traffic Count Survey

Roadside Traffic Count Survey

Survey Location :
Traffic Direction :
Date :
Weather :

Name of supervisor:
Name of surveyor:
Name of coder:



Time \ Vehicle type	1. Sedan, Taxi, Pickup/Van	2.Light Truck(<2.0t, L:<5m)	3. Mid-size Truck(<14.0t, L:<9m)	4. Heavy Truck	5. Marshrutka/Bus
6:00 - 6:15					
6:15 - 6:30					
6:30 - 6:45					
6:45 - 7:00					
7:00 - 7:15					
7:15 - 7:30					
7:30 - 7:45					
7:45 - 8:00					
8:00 - 8:15					
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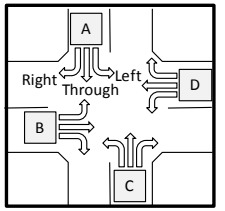
20:15 - 20:30					
20:30 - 20:45					
20:45 - 21:00					
21:00 - 21:15					
21:15 - 21:30					
21:30 - 21:45					
21:45 - 22:00					
16 Hour Daily Total					

Notes :

APPENDIX B-1: Intersection Survey/ Traffic Count in City

Traffic Count by Direction



Survey Location:
Approach: A / B / C / D
Date:
Weather:
Name of Approach A:
Name of Approach B:
Name of Approach C:
Name of Approach D:

Name of supervisor:
Name of surveyor:
Name of coder:

Time / Vehicle Type	1. Sedan, Taxi, Pickup/Van			2.Light Truck(<2.0t, L:<5m)			3. Mid-size Truck(<14.0t, L:<9m)			4. Heavy Truck			5. Marshrutka/Bus			6.Trolley Bus		
	Left Turn	Through	Right Turn	Left Turn	Through	Right Turn	Left Turn	Through	Right Turn	Left Turn	Through	Right Turn	Left Turn	Through	Right Turn	Left Turn	Through	Right Turn
7:00 - 7:15																		
7:15 - 7:30																		
7:30 - 7:45																		
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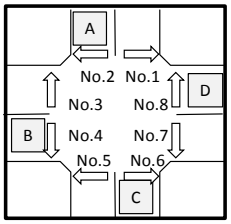
9:00 - 9:15																		
9:15 - 9:30																		
9:30 - 9:45																		
9:45 - 10:00																		

APPENDIX B-2: Intersection Survey/ NMT Count

Traffic Count of Non-Motorized Transport

Survey Location:
Date:
Weather:
Name of Approach A:
Name of Approach B:
Name of Approach C:
Name of Approach D:

Name of supervisor:
Name of surveyor:
Name of coder:



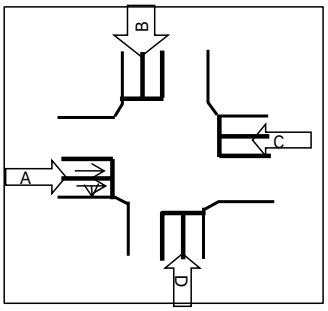
Time \ Direction	No.1	No.2	B-D Total	No.3	No.4	A-C Total	No.5	No.6	B-D Total	No.7	No.8	A-C Total
7:00 - 7:15												
7:15 - 7:30												
7:30 - 7:45												
7:45 - 8:00												
8:00 - 8:15												
8:15 - 8:30												
8:30 - 8:45												
8:45 - 9:00												
9:00 - 9:15												
9:15 - 9:30												
9:30 - 9:45												
9:45 - 10:00												

APPENDIX B-3: Intersection Survey/ Maximum Queue Length

Maximum Queue Length

Survey Location:
Date:
Weather:

Name of supervisor:
Name of surveyor at A:
Name of surveyor at B:
Name of surveyor at C:
Name of surveyor at D:
Name of coder:



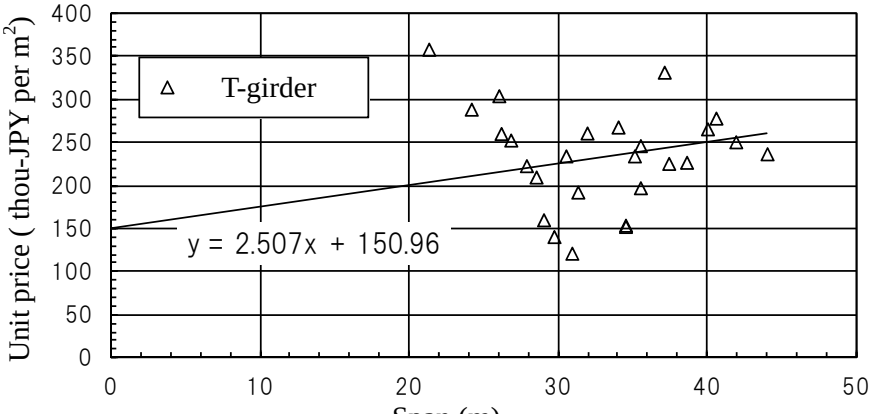
[Unit:m]

Time \ Direction			A [To be Named]	B [To be Named]	C [To be Named]	D [To be Named]
7:00	-	7:15				
7:15	-	7:30				
7:30	-	7:45				
7:45	-	8:00				
8:00	-	8:15				
8:15	-	8:30				
8:30	-	8:45				
8:45	-	9:00				
9:00	-	9:15				
9:15	-	9:30				
9:30	-	9:45				
9:45	-	10:00				

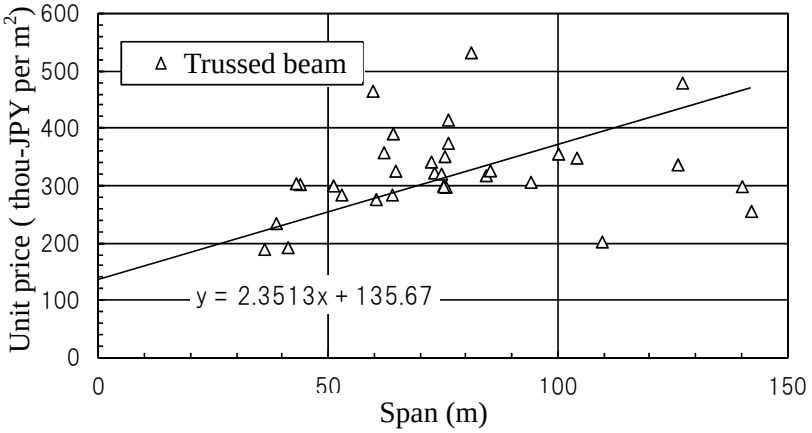
7:00	-	8:00	0	0	0	0
8:00	-	9:00	0	0	0	0
9:00	-	10:00	0	0	0	0

2. Construction Unit Prices by Bridge Types

JICA Survey Team set unit prices defined by span of bridges for both T-girder bridge and trussed beam bridge. Correlation factor of spans of bridges and unit prices are estimated based on the experience in Japan and the Kugaruto Bridge, which was constructed in Kyrgyz by Japanese grant. The unit price of T-girder Bridge in Japan is estimated as shown in the figure below. If bridge span is 30m, the unit price of T-girder Bridge is 226.17 thousand JPY (=2.507× 30+150.69), whereas the Kugaruto Bridge (span is 30m, T-girder Bridge), is estimated as 361.3 thousand JPY with consideration of currency fluctuations. Therefore, using those estimated prices, modification coefficients is set as 1.598 (=361.3 / 226.17). In the same manner, correlation factor of beam bridge is also estimated.



Unit price (per m^2) for T-girder



Unit price (per m^2) for the trussed beam bridge

Figure 1 Estimated Unit Price of Bridge Constructed in Japan

Unit prices of the new bridge on Nurmatov St. and the South Bypass are shown in following table.

Table 1 Unit Price of Construction in This Report

Bridge type and span	Unit price	Memo
Nurmatov（PCT,Span=32m)	369.4 thou-JPY/m2	y=(2.507*x+150.96)*1.598
South Bypass (PCT,Span=45m)	421.5 thou-JPY/m2	y=(2.507*x+150.96)*1.598
South Bypass (Trussed beam)	352.1 thou-JPY/m2	y=(2.3513*x+135.67)*1.598

3. Cost Estimations

Table 2 Construction Cost of Nurmatov St.

Nurmatov	Unit price	Quantity	Cost of construction	Memo
Superstructure	369.4	665.6	245.9	A=20.8×32
Substructure	469.0	990.0	464.3	A1=495m3,A2=495m3
Revetment	898.7	81.6	73.3	L=(10+20.8+10)*2
Temporary Bridge	213.9	360.0	77.0	A=60×6
Removal	415.8	60.0	24.9	L=60
Road（option 1）	35.3	2800.0	98.8	w=7m,L=400m
Road（option 2）	35.3	4800.0	169.4	w=12m,L=400m

Additional Road	Unit price	Quantity	Cost of construction	Memo
Intersection	-	-	50.0	1set=50Billion
Road	35.3	2240.0	79.1	w=7m,L=320m

Table 3 Construction Cost of South Bypass

South Bypass （PCT）	Unit price	Quantity	Cost of construction	Memo
Superstructure	421.5	504.0	212.4	A=11.2×45
Substructure	469.0	990.0	464.3	A1=495m3,A2=495m3
Revetment	898.7	62.4	56.1	L=(10+11.2+10)*2
Road	35.3	1320.0	46.6	w=12m,L=110m
Culvert	469.0	246.4	115.6	V=11.2×22
Total	-	-	895.0	

South Bypass （Trussed beam）	Unit price	Quantity	Cost of construction	Memo
Superstructure	352.1	1008.0	354.9	A=11.2×90
Substructure	469.0	582.4	273.1	V=(11+9+9+23)*11.2
Revetment	898.7	62.4	56.1	L=(10+11.2+10)*2
Road	35.3	720.0	25.4	w=12m,L=60m
Culvert	469.0	246.4	115.6	V=11.2×22
Total	-	-	825.1	

4. Joint Reconnaissance on the Nurmatov St. Bridge

JICA survey team carried out a joint reconnaissance with the staffs of Osh City. The findings of the reconnaissance are shown on the followings.

1) Purpose of Survey

To grasp the conditions of the vicinity of Nurmatov St. Bridge

To confirm the contents of the requirements of Osh City

2) Outlines of Survey

Date: 11th, November, 2015

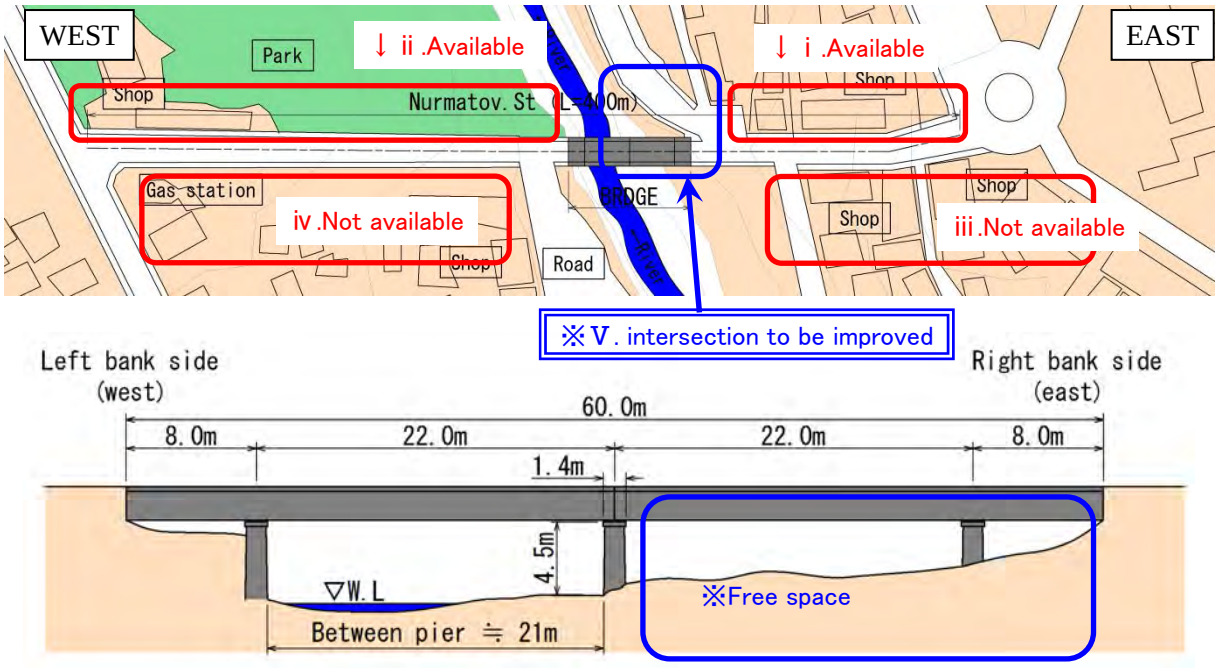
Participants:

Osh City: Mr. Janibekov Ulugbek（Road Management Department, Deputy Head）

JICA Survey Team: Mr. NII Shinnichi, Mr. ABDUKADIROV Rasulbek

3) Findings

- The number of road lanes shall be increased from 2 lanes to 4 lanes. (Road width:14m→20.8m)
- The eastern side shops can be shifted by Osh city authorities. The shops on the north side of road and the east side of the bridge is on private land. These can be moved by Osh City. Because these structures are temporary structure, demolish and rehabilitation are easy.
- It is difficult to move the shops on the south side of the road. The part of the road is available. Osh city requests that the connecting road to the airport be improved.
- Because the flow of the river is controlled by the management facility of the upstream, the river does not overflow on the current section. Therefore the free space in the east side can be used to construct revetments.



i . The Shops on the north-east side of the bridge (available to be moved)	ii . The park (available with extension)
	
iii . The shops on the south-east side of the bridge (not available)	
	
iv . The shops and houses on the south-west side of the bridge (not available)	V .Road to the airport