Table 4.7.1 ATC Air Space Requirements at Priority Airports (1)

Item	1-1 Tashkent	1-2 New Tashkent
Basic Condition RWY(RWY Strip)	① RWY08L/26R: 4000×60m (4120m×300m) ② RWY08R/26L: 3900×45m (4020m×300m)	RWY04/22: 4300×60m (4420m×300m)
RWY Direction	① N 82.0° E(T) ② N 82.0° E(T)	N 40.0° E(T) (assumption)
Field level	① 08L/TDZ: 417m 26R/TDZ: 431m ② 08R/TDZ: 417m 26L/TDZ: 431m ; ARP: 431m	04/TDZ: 350m 22/TDZ: 350m ARP: 350m (assumption)
Aircraft	B747-400 (Cat D)	B747-400 (Cat D)
*		Terrain and obstacles are surveyed with a rough map.
Instrument Approach		
Precision Approach	Possible to be established	Likely to be established with the following proper conditions.
Name	① ILS approach RWY08L ② ILS approach RWY08R ③ ILS approach RWY26R	① ILS approach RWY04 ② ILS approach RWY22
MINIMA	① OCA(H): 447m(30m) RVR: 350m (Cat-II) ; OCA(H): 477m(60m) RVR: 800m (Cat-I) ② OCA(H): 487m(70m) RVR: 900m (Cat-I) ③ OCA(H): 491m(60m) RVR: 800m (Cat-I)	① OCA(H): 380m(30m) RVR: 350m (Cat-II) ; OCA(H): 410m(60m) RVR: 800m (Cat-I) ② OCA(H): 380m(30m) RVR: 350m (Cat-II) ; OCA(H): 410m(60m) RVR: 800m (Cat-I)
GP	3° 00'	3° 00'
Non-precision Approach	Proper to be established	Likely to be established with the following proper conditions.
Name	① VOR/DME approach RWY08L ② VOR/DME approach RWY26R ③ VOR/DME approach RWY08R ④ VOR/DME approach RWY26L	① VOR/DME approach RWY04 ② VOR/DME approach RWY22
MINIMA	① OCA(H): 580m(163m) VIS: 2800m ② OCA(H): 549m(118m) VIS: 2000m ③ OCA(H): 580m(163m) VIS: 2800m ④ OCA(H): 549m(118m) VIS: 2000m	① OCA(H): 470m(120m) VIS: 2000m ② OCA(H): 470m(120m) VIS: 2000m
Circling Approach	Proper to be established	Likely to be established with the following proper conditions.
MINIMA	OCA(H): 641m(210m) VIS: 3600m Only south side of RWY (due to avoiding the dense inhabited area)	OCA(H): 560m(210m) VIS: 3600m
STAR (Standard Instrument Arrival)	Proper to be established for connecting from the gateways	Proper to be established for connecting from the same gateways with the case of Tashkent airport.
Number of Routes	8 routes of RWY08L/08R and 6 routes of RWY26R/26L (correspond to current STARs of 5 directions)	10 routes of both RWY04L/04R and RWY22R/22L (correspond to each RWY from 5 directions)
Gateways	North, North-west, West, East and South of airport	North, North-west, West, East and South of airport (as well as the case of Tashkent airport)
SID (Standard Instrument Departure)	Possible to be established	Likely to be established
Kind of Departure	① RWY08L/08R: Turning departure (only right turn and turning point assigned) RWY26L/26R: Straight-out departure and Turning departure (turning point assigned)	① RWY04: Straight-out departure, Turning departure (both left and right directions) ② RWY22: Straight-out departure, Turning departure (both left and right directions)
Criteria	There is a restricted area at the south of airport	
MINIMA(Take-off)	RVR/VIS: 500m	RVR/VIS: 500m
Gateways	The same as STAR (5 significant directions)	The same as STAR
Transition Route	Proper to be established (the same as current transition routs). For they are connecting to the significant points(NAVAIDS) on Airways in order to conduct an efficient climb under the condition of much traffic flow and congestion.	Proper to be established. For they are connecting to the significant points(NAVAIDS) on Airways in order to conduct an efficient climb under the condition of much traffic flow and congestion
OLS (Obstacle Limitation Surfaces)		
Category	Precision approach Cat- I and Cat- II, Code 4	Precision approach Cat- I, Code 4
Evaluation	Some obstacles near RWY on the airfield shall penetrate the approach surfaces and the transition surfaces.	No terrain obstacle may penetrate.
CTR (Control Zone)		
Configuration	Designated as large as providing the visual control	Designated as large as providing the visual control
Criteria	Visual reporting points should be established.	Visual reporting points should be established
TMA (Terminal Control Area)		
Configuration	Proper to be established and extended to the south much larger than the current TMA (upper to Alt. 6000mMSL properly)	The same area(extended) as the case of Tashkent airport as TRACON
Transfer(Hand-off) point	9 points (the same as the current TMA but changing positions) for 5 gateways	9 points (The same as the case of Tashkent airport as TRACON) for 5 gateways
Criteria	The establishment of TRACON (providing approach control services primarily both for the current airport and new airport) is desirable.	The establishment of TRACON is desirable.
Others	Noise abatement procedures are established for approach and departure of whole RWYs	Noise abatement procedures shall be established for approach and departure of whole RWYs
	Establishment of a new route for over flights of East-West(Fergana region – west part of the territory) through or over the TMA.	Establishment of a new route for over flights of East-West(Fergana region – west part of the territory) through or over the TMA.
	Tashkent or new Tashkent airport is defined as the international and territorial hub airport and the main gateway of territory(including international over flights) for/from the north-east or south-east.	Tashkent or new Tashkent airport is defined as the international and territorial hub airport and the main gateway of territory(including international over flights) for/from the north-east or south-east.

Table 4.7.1 ATC Air Space Requirements at Priority Airports (2)

Item	2 Namangan	3 Andizhan	4 Fergana	5 Kokand
Basic Condition RWY(RWY Strip)	RWY11/29: [New] 3300×50m (3420m×300m)	RWY04/22: [New] 3000×45m (3120m×300m)	RWY18/36: [New] 3300×50m (3420×300m)	RWY07/25: 2200×40m (2320m×300m)
RWY Direction	N 71.5° W(T)	N 45.7° E(T)	N 3.3° E(T)	N 77.5° E(T)
Field level	11/TDZ:515m 29/TDZ:515m ARP:515m (assumption)	04/TDZ:473m 22/TDZ:473m ARP:473m (assumption)	18/TDZ:606m 36/TDZ:606m ARP:606m (assumption)	07/TDZ: 500m 25/TDZ: 498m ARP: 500m
Aircraft	B767 (Cat.D)	B767 (Cat.D)	B767 (Cat.D)	IL114 (Cat.B)
Instrument Approach				
Precision Approach	Possible to be established	ILS approach shall be terminated	Possible to be established	ILS approach shall be no planned.
Name	ILS approach RWY29	-	ILS approach RWY18	-
MINIMA	OCA(H): 585m(70m) RVR: 900m (Cat-I)	-	OCA(H): 666m(60m) RVR: 800m (Cat-I)	-
GP	3° 00'	-	3° 00'	-
Non-precision Approach	Proper to be established	Proper to be established	Proper to be established	Proper to be established
Name	① VOR/DME approach RWY11 ② VOR/DME approach RWY29	① VOR/DME approach RWY04 ② VOR/DME approach RWY22	① VOR/DME approach RWY18 ② VOR/DME approach RWY36	① VOR/DME approach RWY07 ② VOR/DME approach RWY25
MINIMA	① OCA(H): 625m(110m) VIS: 2000m ② OCA(H): 665m(150m) VIS: 2800m	① OCA(H): 583m(110m) VIS: 2000m ② OCA(H): 624m(151m) VIS: 2800m	① OCA(H): 736m(130m) VIS: 2400m ② OCA(H): 736m(130m) VIS: 2400m	① OCA(H): 800m(300m) VIS: 2000m ② OCA(H): 668m(170m) VIS: 1600m
Circling Approach	Proper to be established	Proper to be established	Proper to be established	Proper to be established
MINIMA	OCA(H): 725m(210m) VIS: 3600m Only south side of RWY (due to avoiding the dense inhabited area)	OCA(H): 683m(210m) VIS: 3600m Only west side of RWY (due to higher obstacle)	OCA(H): 816m(210m) VIS: 3600m Only east side of RWY (due to restricted area)	OCA(H): 710m(210m) VIS: 1600m Only north side of RWY (due to avoiding terrain obstacle)
STAR (Standard Instrument Arrival)	Proper to be established for connecting from the gate-ways	Proper to be established for connecting from the gate-ways	Proper to be established for connecting from the gate-ways	Proper to be established for connecting from the gate-ways
Number of Routes	6 routes of both RWY (correspond to current STARs of 3 directions)	6 routes of both RWY (correspond to current STARs of 3 directions)	6 routes of both RWY (correspond to current STARs of 3 directions)	8 routes of both RWY (correspond to current STARs of 4 directions)
Gateways	West, East and South of airport	West, East and South of airport	West, East and North of airport	North-west, West, East and North-east of airport
SID (Standard Instrument Departure)	Possible to be established	Possible to be established	Possible to be established	Possible to be established
Kind of Departure	① RWY11: Turning departure (only right turn and turning Alt (200mAGL) assigned) ② RWY29: Turning departure (only left turn and turning Alt (200mAGL) assigned)	① RWY04: Turning departure (only left turn and Turning point assigned) ② RWY22: Turning departure (only right turn)	① RWY18: Turning departure (only left turn and turning area assigned) ② RWY36: Turning departure (only left turn and turning point assigned)	① RWY07: Turning departure (only left turn and turning Alt (300mAGL) assigned) ② RWY25: Turning departure (only right turn and turning Alt (300mAGL) assigned)
Criteria		Straight-out or left turn departure of RWY22 is not proper due to a restricted area at the south of airport.	Straight-out or right turn departure of RWY18 is not proper due to restricted area. Turning departure of RWY36 is assigned for left due to avoiding the dense inhabited area.	Right turn departure of RWY07 and left turn departure of RWY25 are not proper due to a restricted area at the south of airport.
MINIMA(Take-off)	RVR/VIS: 500m	RVR/VIS: 500m	RVR/VIS: 500m	RVR/VIS: 500m
Gateways	The same as STAR	The same as STAR	The same as STAR	The same as STAR
Transition Route	Not necessary to be established. For SIDs are direct to connect Airways.	Not necessary to be established. For SIDs are direct to connect Airways.	Proper to be established: For they are forward to the NAVAIDs of Namangan and Andzjan and the airport point of Kokand to connect to Airways.	Not necessary to be established SIDs are direct to connect Airways.
OLS (Obstacle Limitation Surfaces)				
Category	Precision approach Cat-I, Code 4	Precision approach Cat-I, Code 4	Precision approach Cat-I, Code 4	Precision approach Cat-I, Code 4
Evaluation	Some facilities related to aircraft operations may penetrate transition surfaces.	Some facilities related to aircraft operations may penetrate transition surfaces.	Some facilities related to aircraft operations may penetrate transition surfaces.	Nothing seems to penetrate.
CTR (Control Zone)				
Configuration	Designated as large as providing the visual control	Designated as large as providing the visual control.	Designated as large as providing the visual control.	Designated as large as providing the visual control
Criteria	Visual reporting points should be established.	Visual reporting points should be established.	Visual reporting points should be established.	Visual reporting points should be established.
TMA (Terminal Control Area)				
Configuration	Proper to be established as well as the current and according to the position and altitude of transfer points. (current Alt. 6000mAGL)	Proper to be established as well as the current and according to the position and altitude of transfer points. (current Alt. 3000mAGL)	Proper to be established as well as the current and according to the position and altitude of transfer points. (current Alt. 6000mAGL)	Proper to be established as well as the current and according to the position and altitude of transfer points. (current Alt. 4500mAGL)
Transfer(Hand-off) point	6 points (the same as the current TMA) for 3 gateways	3 points (the same as the current TMA) for 3 gateways	3 points (the same as the current TMA) for 3 gateways	4 points (the same as the current TMA) for 4 gateways
Criteria	TMA shall be combined to the new TRACON established of 4 airports in Fergana region.	TMA shall be combined to the new TRACON established of 4 airports in Fergana region..	TMA shall be combined to the new TRACON established of 4 airports in Fergana region.	TMA shall be combined to the new TRACON established of 4 airports in Fergana region.
Others	Noise abatement procedures shall be established for RWY11 departure and RWY29 landing.	Noise abatement procedures shall be established for RWY04 departure and RWY22 landing.	Noise abatement procedures shall be established for RWY36 departure and RWY18 landing.	
	There is the restricted area close to the north of airport due to the territorial boundary.	There is the restricted area in the south of airport and territorial boundary near east side of airport.	The departure route of RWY18(new RWY) is bordered to the restricted area at the south-west of airport more closely than the current departure route.	

Table 4.7.1 ATC Air Space Requirements at Priority Airports (3)

Item	6 Samarkand	7 Termez	8 Karshi	9 Bukhara
Basic Condition RWY(RWY Strip)	RWY09/27: 3100×49m (3220×300m)	RWY07/25: 3000×45m (3120m×300m)	RWY16/34: 3000×45m (3120m×300m)	RWY01/19: 3100×45m (3220m×300m)
RWY Direction	N 48.3° W(T)	N 74.1° E(T)	N 20.2° W(T)	N 10.2° E(T)
Field level	09/TDZ: 665m 31/TDZ: 678m ARP: 678m	07/TDZ: 309m 25/TDZ: 313m ARP: 313m	16/TDZ: 374m 34/TDZ: 371m ARP: 374m	01/TDZ: 225m 19/TDZ: 229m ARP: 229m
Aircraft	B767 (Cat.D)	B767 (Cat.D)	B767 (Cat.D)	B767 (Cat.D)
Instrument Approach				
Precision Approach	Possible to be established	Possible to be established	ILS approach shall be terminated	Possible to be established
Name	ILS approach RWY09	ILS approach RWY25	-	ILS approach RWY01
MINIMA	OCA(H): 735m(70m) RVR: 900m (Cat- I)	OCA(H): 393m(80m) RVR: 1000m (Cat- I)	-	OCA(H): 290m(65m) RVR: 800m (Cat- I)
GP	3° 00'	3° 00'	-	3° 00'
Non-precision Approach	Proper to be established	Proper to be established	Proper to be established	Proper to be established
Name	① VOR/DME approach RWY09 ② VOR/DME approach RWY27	VOR/DME approach RWY25 *The instrument approach is not established for RWY07.	① VOR/DME approach RWY16 ② VOR/DME approach RWY34	① VOR/DME approach RWY01 ② VOR/DME approach RWY19
MINIMA	① OCA(H): 815m(150m) VIS: 2800m ② OCA(H): 818m(140m) VIS: 2800m	OCA(H): 413m(100m) VIS: 2000m	① OCA(H): 494m(120m) VIS: 2000m ② OCA(H): 491m(120m) VIS: 2000m	① OCA(H): 364m(139m) VIS: 2400m ② OCA(H): 349m(120m) VIS: 2000m
Circling Approach	Proper to be established	Proper to be established	Proper to be established	Proper to be established
MINIMA	OCA(H): 888m(210m) VIS: 3600m Only north side of RWY (due to avoiding the higher obstacle)	OCA(H): 583m(270m) VIS: 4400m Only north side of RWY (due to restricted area)	OCA(H): 584m(210m) VIS: 3600m -	OCA(H): 439m(210m) VIS: 3600m Only east side of RWY (due to higher obstacle)
STAR (Standard Instrument Arrival)	Proper to be established for connecting from the gate-ways	Proper to be established for connecting from the gate-ways	Proper to be established for connecting from the gate-ways	Proper to be established for connecting from the gate-ways
Number of Routes	6 routes of both RWY (correspond to current STARs of 3 directions)	3 routes of RWY25 (correspond to current STARs of 2 directions)	7 routes of both RWY (correspond to current STARs of 3 directions)	8 routes of both RWY (correspond to current STARs of 3 directions)
Gateways	West, East and South of airport	North and South of airport	West, East and North of airport	West, East and North of airport
SID (Standard Instrument Departure)	Possible to be established	Possible to be established	Possible to be established	Possible to be established
Kind of Departure	① RWY09: Turning departure (only left turn and turning Alt.(300mAGL) assigned) ② RWY27: Straight-out departure and Turning departure(only right turn and turning Alt.(600mAGL) assigned)	① RWY07: Turning departure (only left turn and turning Alt.(200mAGL) assigned) ② RWY25: Turning departure (only right turn and turning area assigned) departure	① RWY16: Turning departure (turning Alt.(200mAGL) assigned) ② RWY34: Straight-out departure and Turning departure (turning Alt.(200mAGL) assigned)	① RWY01: Straight-out departure and Turning departure (turning Alt. (200mAGL) assigned) ② RWY19: Turning departure (turning Alt. (200mAGL) assigned)
Criteria		Right turn departure of RWY07 and Left turn departure of RWY25 are not proper due to a restricted area.		
MINIMA(Take-off)	RVR/VIS: 500m	RVR/VIS: 500m	RVR/VIS: 500m	RVR/VIS: 500m
Gateways	The same as STAR	The same as STAR	The same as STAR	The same as STAR
Transition Route	Proper to be established: For they are connecting to the significant points(gate-ways) of all directions on Airways.	Not necessary to be established: For SIDs are direct to connect to the gate-ways on Airways.	Proper to be established: For they are connecting to the gate-ways after being separated from SIDs.	Proper to be established: For there are expected many traffic due to the junction of air routes over Bukhara
OLS (Obstacle Limitation Surfaces)				
Category	Precision approach Cat- I , Code 4	Precision approach Cat- I , Code 4	Precision approach Cat- I , Code 4	Precision approach Cat- I , Code 4
Evaluation	No obstacles may penetrate (as the modernization project is in progress.)	Dispatch(Start control position) cabin and other facilities related to aircraft operations may penetrate transition surfaces.	Some facilities related to aircraft operations may penetrate transition surfaces.	No obstacles may penetrate. (as the modernization project is in progress.)
CTR (Control Zone)				
Configuration	Designated as large as providing the visual control.	Designated as large as providing the visual control	Designated as large as providing the visual control.	Designated as large as providing the visual control
Criteria	Visual reporting points should be established.	Visual reporting points should be established.	Visual reporting points should be established.	Visual reporting points should be established.
TMA (Terminal Control Area)				
Configuration	Proper to be established as well as the current and according to the position and altitude of transfer points. (current Alt. 4500mAGL)	Proper to be established as well as the current and according to the position and altitude of transfer points. (current Alt. 4500mAGL)	Proper to be established as well as the current and according to the position and altitude of transfer points. (current Alt. 5700mAGL)	Proper to be established according to the position and altitude of transfer points. (current Alt. 4500mAGL)
Transfer(Hand-off) point	9 points (the same as the current TMA) for 3 gateways	3 points (the same as the current TMA) for 2 gateways	6 points (the same as the current TMA) for 3 gateways	8 points(some positions are changed.) for 3 gateways.
Criteria	There are significant fixes in TMA, which are connecting the STAR and SID with the routes from outside of TMA.	The TMA is limited at south side due to territorial boundary.	TMA shall be terminated and comprised in ACC in the long future.	TMA shall be extended toward the north-east according to comprising Navoi TMA in the long future.
Others	Noise abatement procedures shall be established for RWY09 departure and RWY27 approach.	Noise abatement procedures shall be established for RWY07 departure and RWY25 departure and landing.		
	Samarkand airport is defined as the International airport and core airport at the central part of territory.	Territory boundary zone is designated at the east and south of airport.		
		Termez airport is defined as the International airport and the main gateway of territory(including international over flights) for/from the south.		

Table 4.7.1 ATC Air Space Requirements at Priority Airports (4)

Item	10 Navoi	11 Urgench	12 Nukus
Basic Condition RWY(RWY Strip)	RWY07/25: 3100×45m (3220m×300m)	RWY13/31: 3000×45m (3120×300m)	RWY15/33: 3000×48m (3120m×300m)
RWY Direction	N 77.5° E(T)	N 41.5° W(T)	N 25.5° W(T)
Field level	07/TDZ: 344m 25/TDZ: 347m ARP: 347m	13/TDZ: 97m 31/TDZ: 97m ARP: 97m	15/TDZ: 76m 33/TDZ: 75m ARP: 76m
Aircraft	B767 (Cat.D)	B767 (Cat.D)	B767 (Cat.D)
Instrument Approach			
Precision Approach	ILS approach shall be no planned.	Possible to be established	Possible to be established
Name	-	ILS approach RWY31	ILS approach RWY33
MINIMA	-	OCA(H): 167m(70m) RVR: 900m (Cat- I)	OCA(H): 135m(60m) RVR: 800m (Cat- I)
GP	-	3° 00'	3° 00'
Non-precision Approach	Proper to be established	Proper to be established	Proper to be established
Name	① VOR/DME approach RWY07 ② VOR/DME approach RWY25	① VOR/DME approach RWY13 ② VOR/DME approach RWY31	① VOR/DME approach RWY15 ② VOR/DME approach RWY33
MINIMA	① OCA(H): 464m(120m) VIS: 2000m ② OCA(H): 467m(120m) VIS: 2000m	① OCA(H): 202m(105m) VIS: 2000m ② OCA(H): 197m(100m) VIS: 2000m	① OCA(H): 196m(120m) VIS: 2000m ② OCA(H): 195m(120m) VIS: 2000m
Circling Approach	Proper to be established	Proper to be established	Proper to be established
MINIMA	OCA(H): 647m(300m) VIS: 4000m -	OCA(H): 307m(210m) VIS: 3600m Only north side of RWY (due to avoiding the dense inhabited area)	OCA(H): 338m(262m) VIS: 4400m -
STAR (Standard Instrument Arrival)	Proper to be established for connecting from the gate-ways	Proper to be established for connecting from the gate-ways	Proper to be established for connecting from the gate-ways
Number of Routes	4 routes of both RWY (correspond to current STARs of 3 directions)	6 routes of both RWY (correspond to current STARs of 3 directions)	8 routes of both RWY (correspond to current STARs of 3 directions)
Gateways	West, East and North of airport	West, East and North of airport	West, East and South of airport
SID (Standard Instrument Departure)	Possible to be established	Possible to be established	Possible to be established
Kind of Departure	① RWY07: Turning departure (only left turn and turning Alt.(300mAGL) assigned) ② RWY25: Turning departure (only right turn and turning Alt.(200mAGL) assigned)	① RWY13: Straight-out departure and Turning departure (turning Alt.(300mAGL) assigned) ② RWY31: Straight-out departure and Turning departure (turning Alt.(200mAGL) assigned)	① RWY15: Turning departure (turning Alt.(300mAGL) assigned) ② RWY31: Straight-out departure and Turning departure (turning Alt.(200mAGL) assigned)
Criteria			Straight-out departure RWY15 is not established due to approaching the restricted area of territorial boundary.
MINIMA(Take-off)	RVR/VIS: 500m	RVR/VIS: 500m	RVR/VIS: 500m
Gateways	The same as STAR	The same as STAR	The same as STAR
Transition Route	Proper to be established: For they are connecting to the significant points(NAVAIDS) on Airways.	Not necessary to be established. For SIDs shall be connecting to the significant points(gate-ways) on Airways.	Not necessary to be established: For it is available to conduct on-course-climb by Airways
OLS (Obstacle Limitation Surfaces)			
Category	Precision approach Cat- I , Code 4	Precision approach Cat- I , Code 4	Precision approach Cat- I , Code 4
Evaluation	A man-made obstacle(power plant) at a little far west of airport penetrates outer horizontal surface(150mAGL)	No obstacles may penetrate. (as the modernization project is in progress.)	Starter cabins and other facilities related to aircraft operating may penetrate transition surfaces.
CTR (Control Zone)			
Configuration	Designated as large as providing the visual control	Designated as large as providing the visual control	Designated as large as providing the visual control.
Criteria	Visual reporting points should be established.	Visual reporting points should be established.	Visual reporting points should be established.
TMA (Terminal Control Area)			
Configuration	Proper to be established as well as the current and according to the position and altitude of transfer points. (current Alt. 6000mAGL)	Proper to be established as well as the current and according to the position and altitude of transfer points. (current Alt. 4500mAGL)	Proper to be established as well as the current and according to the position and altitude of transfer points. (current Alt. 4500mAGL)
Transfer(Hand-off) point	4 points (the same as the current TMA) for 3 gateways	6 points (the same as the current TMA) for 3 gateways	9 points (the same as the current TMA) for 3 gateways
Criteria	TMA shall be combined to the Bukhara TMA in the long future.		
Others	The restricted area is designated at the south of airport.	Noise abatement procedures shall be established for RWY13 departure and RWY31 approach.	Noise abatement procedures shall be established for RWY15 departure and RWY33 approach.

4.7.3 Air Traffic Control System Development

At the Air Traffic Control field, the improvements and functional advances of global operations systems shall be conducted, and since the adaptation to the integrated system on a world-wide scale is desirable, it is necessary to gradually adjust to this as ICAO develops in Uzbekistan.

In particular, the development of individual services related to ATC, AIS, COM, SAR, MET, etc. shall be planned, being at the center of functional advance and performance of Information/Communication Network in relation to Air Traffic Services on the basis of the idea of FANS/ATM. Accordingly, the ideas of present SSR should be adapted to ICAO standards and the efficient operation of ATC data, or information shall be assured. The communication network or data network might be established for the regional (Central Asia) network or integrated into the European network by SITA. As for the total network of ATC communication/information, this idea of ATN(Aeronautical Telecommunication Network) exists in the FANS concept and the gradual adjustment towards it shall be planned in the future.

Radar Data Processing System, Flight Data Processing System and RCAG(Remote Center Air-Ground Communication) or Control system of communication and data-link, etc. shall be introduced in a positive manner.

For the future, the total ATC center will most likely be established at the new Tashkent airport and it shall be the only facility using FANS and ATM(Air Traffic Control, Air Traffic Flow Management and Air Space Management) integration, including critical situation management for Air Traffic Services(ATS).

Finally, the regulation and practice procedures of ATC should be studied and applied to the ATS through adjustment of the technical conditions as SSR mode S, ACAS, VHS Data-link, ADS, MLS, GNSS, ILS(Cat-III) and R-NAV, etc..

4.7.4 Air Traffic Control Service Development

(1) Procedural Improvement

ATC Service Development shall be geared to the improvements of the airports. The increase in traffic volume and the global and regional trends at ICAO or other organizations, shall be taken into account. Especially cooperation with other CIS countries in the Central Asia region and the up-grade of ATC procedures corresponding to the enforcement of the ATC system should be necessary. It is also important to conduct gradual improvements, on the basis of ATC operations and to establish the operational interface condition, between ATC equipment or system and controller's work.

In the field of ATC services, it is necessary to maintain progress in improvements of operational procedures, operational systems and training systems, as well as the adjustments to regulations in order to transfer the ATC services to ICAO standards appropriately and quickly.

At the Aerodrome control, the ATC services, shall be established by visual control at the aircraft take-off or landing stage (Local control) and for local flight in the CTR, and the stage(Ground control) of maneuvering of aircraft or other vehicles on the ground.

At the Approach Control and Area(En-route) Control, the provision of ATC services shall be conducted appropriately according to the improvements of the ATC equipment, Radar and Communication.

In addition, according to the increase in the territorial gateways of air routes (at present, Nukus, Bukhara, Tamdybulak, Termez and Tashkent (as NAVAIDS)) and the improvement of territorial procedures, the ATC procedures shall be improved in relation to the provision of continuous ATC services, with the neighbouring ACC of other countries and the smooth transfer of ATC. As these are related to the territorial control of air space or the national air defense, it is necessary to coordinate with the authorities concerned.

To meet the future increase in and variety of, air traffic volume, it is therefore appropriate to conduct these first improvement steps in the current ATC systems and it is wise in the long term, to introduce or make qualitative advances of ATC services, according to the development in new types of aircraft and the introduction of FANS, etc.. At first, it is necessary to establish the ATC procedures corresponding to the ADS(Automated Dependent Surveillance) which is expected to be introduced as well as R-NAV on the stage of Area(En-route) control level.

And the definite improvement or adjustment is considered necessary for practical reasons as follows:

- The system of conducting ATC services efficiently shall be established for introducing the appropriate shift-system according to the operational hours of the airport, for example 5 shifts at 24 hours operation of ACC, international airport or main airport, and others.
- By changing QFE (dimension of altitude measure above the level of the end of landing RWY) to QNH (dimension of altitude measure above the sea level) and meters to feet as the vertical unit, and the standardization for ICAO, the transfer procedures of ATC services shall be conducted in safety and, with efficiency with the adjacent ATC authorities of other countries.
- The ATC procedures for the VFR traffic around the airport shall be established so that they can coexist with IFR traffic.
- Visual ATC by flashing 'light-gun' signals should be established.
- The procedure of negotiated deals and ATC execution with regard to flight plans shall be standardized for ICAO.
- The division of ATC services, the jurisdictional area of ATC division and the situation of aircraft with provision of ATC, etc. shall be standardized for ICAO. The ATC positions shall be standardized for ICAO and designated that the Starter Controller and Landing Controller(of Radar Service) at present, should be combined with the Local Controller in the ICAO standards. The Taxiing Controller should change functionally to the Ground controller to provide ATC on a maneuvering area at aerodromes, while the Clearance Delivery and the Coordinator might be newly defined, etc..
- The soundness of the system, the adjustment and appropriateness of regulations especially separation minimum of ATC(the interval of time or distance, Radar separation) and the establishment of procedural ATC (ATC without Radar services) shall be assured and it is important to achieve efficiency of ATC operation, the establishment and publication of desirable flight-planned-routes, the simplification of procedures for foreign aircraft operation and the training of capable staff are essential.

(2) ATC Services at Airport

Therefore the expected development of ATC services at each airport are shown in the **Tables 4.7.2**, (1)~(3). These are arranged according to the study of ATC services under the following conditions:

- The kind of ATC, and the kind of each ATC position, shall be adapted to ICAO standards.
- As the essential criterion, the ATC feasibility will be whether the expected aircraft movements at peak hours at each airport will be feasible or not with regard to the ATC capacity(the 24 times at maximum load is supposed).
- The applicable items for the ICAO SARPs (Standard and Recommended Practices) shall be followed.
- The other services related to ATC such as ATIS(Automated Terminal Infonnation Service), etc. shall be followed.
- As mentioned above. The present year 1997 and the near future up to 2005, and the long future up to 2020, the expected establishment of ATC services shall be arranged gradually according to the increase of traffic volume.
- The ATC services which are provided by a military Air Traffic Controller are situated at the military airports, but it is not intended that these military ATC services shall be transferred to the civil ATC services.

(3) ATC Institution of Training

The training system for the modernized or advanced ATC such as FANS, should be established in the future. As the advanced western made ATC equipment is gradually introduced at the local airports, familiarity with or technical development of, Air Traffic Controller should be assured. Regarding the ATC of International over-flights, International arrivals or departures, controllers should communicate in English, and conduct the ATC of ICAO standards, and understand the performance of western made aircraft. So a proper organization of ATC services and the ATC training system should be established. In the future, the training center should be advanced and generalized with an integrated training system.

Besides, the agreement of ATC provision with the relevant authorities of other countries, especially with the neighboring ACCs or ATC authorities, should be established and appropriately maintained and the procedural rules should be adjusted, and up-dated individually with each ATC authority, depending on the revision of state regulations. The agreement of Air Space Use with other countries should also be adjusted appropriately, and the proper air space conditions for ATC services which are not always in agreement with the territorial air space should be established. In particular, the air space for ATC around Tashkent airport(new airport) is located in the territorial air space of Kazakhstan and the appropriate reconstruction of the air space use will be necessary for the future, depending on the increase in traffic volume. It will be also necessary that the practical system of air space management in the wide area beyond the State territory, is established among the relevant countries in the Central Asian region.

According to the development or improvement of ATC systems, the enforcement of the constitution of 'Uzaeronavigation' should be necessary with regard to the completion of the

rating system of ATC services and controllers, the advance of air safety inspection related to the case of mistaken provision of ATC service, the appropriate management of personnel affairs, the efficient assignment of personnel, the effective technical transfer from Russian specialists to local(Uzbekistan) staff and the appointment of female staff, etc..

[Specific Note]

Abbreviations

ACAS: Airborne Collision Avoidance System
ACC: Area Control Center
ADS: Automatic Dependent Surveillance
AGL: Above Ground Level
AIS: Aeronautical Information Services
Alt: Altitude
ARP: Airport Reference Point
ASDE: Airport Surface Detecting Equipment
ATC: Air Traffic Control
ATIS: Automatic Terminal Information Service
ATM: Air Traffic Management
ATN: Aeronautical Telecommunications Network
ATS: Air Traffic Services
AWO: All Weather Operations
Cat: Category
CTR: Control Zone
COM: Communications
DH(A): Decision Height(Altitude)
DME: Distance Measuring Equipment
FANS: Future Air Navigation Systems
FIR: Flight Information Region
GCA: Ground Control Approach
GND: Ground or Ground Controller
GNSS: Global Navigation Satellite System
GP: Glide Pass
ICAO: International Civil Aviation Organization Weather
IFR: Instrument Flight Rules
LCL: Local Controller
MAX: Maximum
MDA: Minimum Descent Altitude
MET: Meteorology or Meteorological
MINIMA: Minimum condition
MLS: Micro-wave Landing System
MNM: Minimum
MSL: Mean Sea Level
NAV: Navigation
NAVAIDS: Navigation Aids
NDB: Non-Directional Radio Beacon
OCH(A): Obstacle Clearance Height(Altitude)
OLS: Obstacle Limitation Surfaces
PANS-OPS: Procedures for Air Navigation Services – Aircraft Operations
PAR: Precision Approach Radar
QFE: Atmospheric pressure at aerodrome elevation (or at runway threshold)

QNH: Altimeter sub-scale setting to obtain elevation when on the ground
RCAG: Remote Center Air - Ground Communication
R-NAV: Area Navigation
RNP: Required Navigation Performance
RVR: Runway Visual Range (measured article)
RWY: Runway
SAR: Search and Rescue
SARPS: Standards and Recommended Practices
SID: Standard Instrument Departure
SITA: Societe International de Telecommunications Aeronautiques
STAR: Standard Instrument Arrival
SSR: Second Surveillance Radar
TDZ: Touch-down Zone
TMA: Terminal Control Area
TRACON: Terminal Radar Approach Control
VAR: (Magnetic) Variation
VIS: Visibility
VFR: Visual Flight Rules
VOR: VHF Omni-directional Range
WX: Weather

Calculation for ATC feasibility

Landing/Take-off maximum availability per hour

12 (Landing),
12 (Take-off),
24 (Total)

∴ Approach longitudinal separation minimum: 20km equal to 5 minutes (at 130kts).
Take-off interval minimum (avoiding Wake-turbulence): 3 minutes.
The case is considered that landing times and take-off times happen equally.

Table 4.7.2 ATC Service Development at Priority Airports (1)

Item	1 Tashkent(New Tashkent)			2 Namangan			3 Fergana			4 Andizhan		
	1997	2005	2020	1997	2005	2020	1997	2005	2020	1997	2005	2020
Kind of ATC	Aerodrome Control Service	Aerodrome Control Service	Aerodrome Control Service [Both of airports]	Aerodrome Control Service	Aerodrome Control Service	Aerodrome Control Service	Aerodrome Control Service	Aerodrome Control Service	Aerodrome Control Service	Aerodrome Control Service	Aerodrome Control Service	Aerodrome Control Service
	Radar Approach Control Service	Approach Control Service	Terminal Approach Control Service (TRACON) [New Tashkent]	Radar Approach Control Service	Approach Control Service	GCA Services	Radar Approach Control Service	Approach Control Service		Radar Approach Control Service	Approach Control Service	
	GCA Service	GCA Service	GCA Service [Both of airports]	GCA Service	GCA Service			Radar Service			Radar Service	
	En-route Radar Control Service	En-route Control Service	En-route Control Service [New Tashkent]		Radar Service							
		Radar Service	Radar Service [New Tashkent]									
Organization ATC Position Aerodrome control	Start	Local	[Both of airports] Local	Start	[visual control is established] Local	Local	Aerodrome (combination of Start and Landing)	Local	Local	Aerodrome (combination of Start and Landing)	[visual control is established] Local	Local
	Taxiing	Ground	Ground		Ground	Ground		Ground	Ground		Ground	Ground
	Supervisor	Supervisor	Coordinator			Supervisor			Coordinator			Coordinator
			Clearance Delivery						Supervisor			Supervisor
			Supervisor									
Approach Control	Approach	Approach	[New Tashkent] Approach #divided into sectors	Approach	Approach	Circle (GCA)	Approach	Approach	(combined to the TRACON)	Approach	Approach	(Combined to the TRACON)
	Circle	Departure	Departure #divided into sectors	Circle	Departure	Landing(GCA)	Circle	Departure		Circle	Departure	
	Landing	Circle	Coordinator #divided into sectors	Landing	Circle	Coordinator	Supervisor	Circle		Supervisor	Circle	
	Supervisor	Landing(GCA)	Landing(GCA)	Supervisor	Landing(GCA)	(Other kinds of approach control are combined to the TRACON)		Supervisor			Supervisor	
		Coordinator	Supervisor		Supervisor							
		Supervisor										
En-route Control(ACC)	ACC(Radar) # 4 sectors	ACC (Radar) # 4 sectors	[New Tashkent] ACC (Radar) #divided into sectors									
	Coordinator # 4 sectors	Coordinator # 4 sectors	Coordinator #divided into sectors									
	Supervisor	ADS position	ADS position #divided into sectors									
		Supervisor	ATM position									
			Supervisor									
ATC feasibility Landing/Take-off activities(peak hour)	-	(15) below max.	(20) below max.	-	(6) below max.	(8) below max.	-	(8) below max.	(9) below max.	-	(8) below max.	(9) below max.
Requirement for ICAO SARPs	-	FANS(Over flight En-route control)	FANS(Whole En-route control)	-	Establishment for standard level.	Local facility of FANS (Terminal Control)	-	Establishment for the standard level	Local facility of FANS (Terminal control)	-	Established for The standard level.	Local facility of FANS (Terminal Control)
		The ATC of Visual signal('light-gun')	FANS(Terminal control)		The ATC of visual signal('light-gun)	ATN(connected to Tashkent Center)		The ATC of visual signal('light-gun')	ATN(connected to Tashkent Center)		The ATC of visual signal('light-gun')	ATN(connected to Tashkent Center)
		Ground control Services with ASDE	ATM (Territory Main Center)									
			ATN (Territory Main Center)									
Others	H24 operations and hub airport in Uzbekistan	Up-graded communication lines to all airport ATCs and the adjacent ACCs	The center of TRACON and ACC shall be established at the new Tashkent airport.	H24 operation, Alternate airport of Tashkent airport		Approach Control Services shall be combined to the TRACON of Fergana 4 airports.		ATC shall be combined with civil traffic and military traffic.	Approach Control Services shall be combined to the TRACON of Fergana 4 airports.		ATC shall be combined with civil traffic and military traffic.	Approach Control Services shall be combined to the TRACON of Fergana 4 airports.
	ATIS is provided.	Establishment for the AIS network	Training organization shall be completed and upgraded at the Tashkent airport.			Upgraded communication lines to Tashkent, Kokand, Fergana and Andzjan.		Up-graded communication lines to Tashkent, Kokand, Namangan.			Up-graded communication lines to Tashkent, Kokand, Namangan	
		Training system is progressed				RCAG network of Tashkent ACC						

Table 4.7.2 ATC Service Development at Priority Airports (2)

Item	5 Kokand			6 Samarkand			7 Termez			8 Karshi		
	1997	2005	2020	1997	2005	2020	1997	2005	2020	1997	2005	2020
Kind of ATC	Aerodrome Control Service	Aerodrome Control Service	Aerodrome Control Service	Aerodrome Control Service	Aerodrome Control Service	Aerodrome Control Service	Aerodrome Control Service	Aerodrome Control Service	Aerodrome Control Service	Aerodrome Control Service	Aerodrome Control Service	Aerodrome Control Service
	Radar Approach Control Service	Approach Control Service	Approach Control Service	Radar Approach Control Service	Approach Control Service	Approach Control Services	Radar Approach Control Service	Approach Control Service	Approach Control Service	Radar Approach Control Service	Approach Control Service	
	En-route Radar Control Service	En-route Control Service	Radar Service	GCA Service	GCA Service	GCA Service	En-route Radar Control Service	En-route Control Service	Radar Service		Radar Service	
		Radar Service		En-route Radar Control Service	En-route Control Service	Radar Services		Radar Service				
					Radar Service							
Organization ATC Position Aerodrome control	Start	[visual control is established] Local	Local	Start	Local	Local	Start	Local	Local	Aerodrome (combination of Start and Landing)	[visual control is established.] Local	Local
		Ground	Ground	Taxiing	Ground	Ground		Ground	Ground		Ground	Ground
					Supervisor	Coordinator			Coordinator			Coordinator
						Supervisor						Supervisor
Approach Control	Approach	Approach	[TRACON] Approach #divided into sectors	Approach	Approach	Approach(divided into sectors)	Approach	Approach	Approach(divided into sectors)	Approach	Approach	(terminated)
	Circle	Circle	Departure #divided into sectors	Circle	Departure	Departure(divided into sectors)		Departure	Departure	Circle(Landing)	Circle	
	Landing	Coordinator	Coordinator #divided into sectors	Landing	Circle	Coordinator (divided into sectors)		Supervisor	Coordinator	Supervisor	Coordinator	
	Supervisor	Supervisor	Supervisor	Supervisor	Landing	Landing			Supervisor		Supervisor	
					Supervisor	Supervisors						
En-route Control(ACC)	ACC(Radar) # 2 sectors	ACC(Radar) #divided into sectors	(combined to Tashkent ACC)	ACC(Radar) # 3 sectors	ACC(Radar) #divided into sectors	(combined to Tashkent ACC)	ACC(Radar)	ACC(Radar) #divided into sectors	(combined to Tashkent ACC)			
	Supervisor	Coordinator #divided into sectors		Supervisor	Coordinator #divided into sectors		Supervisor	Coordinator #divided into sectors				
		Supervisor			Supervisors			Supervisor				
ATC feasibility Landing/Take-off activities(peak hour)	-	(2) below max.	(2) below max.	-	(7) below max.	(8) below max.	-	(5) below max.	(6) below max.	-	(5) below max.	(6) below max.
Requirement for ICAO SARPs	-	The ATC of visual signal('light-gun')-	FANS (Terminal control)	-	FANS(Over-flight en-route control)	FANS (whole en-route control)	-	Establishment for standard level. (Terminal Control)	FANS (Terminal control)	-	Establishment for the standard level	Local facility of FANS (Terminal Control)
			ATN(connected to Tashkent Center)		The ATC of visual signal('light-gun')	FANS (Terminal Control)		The ATC of visual signal('light-gun)	ATM(local center of south part)		The ATC of visual signal('light-gun')	
						ATN(connected to Tashkent Center)		FANS(over flight en-route control)	ATN(connected to Tashkent Center)			
Others	Auxiliary ACC for Tashkent	Up-graded communication lines to Tashkent	The TRACON of Fergana 4 airports shall be established instead of auxiliary ACC.	International airport	Up-graded communication lines to Tashkent, Termez, Bukhara, Navoi and Karshi.	ACC shall be combined to Tashkent ACC.	International airport	Up-graded communication lines to Tashkent, Samarkand, Karsh, Bukhara and the adjacent ACCs.	Auxiliary ACC shall be combined to Tashkent ACC.		Up-graded communication lines to Samarkand, Bughara, Termez	Approach Control Services shall be terminated and transferred to Tashkent ACC.
			Up-graded Communication lines to Tashkent, Namangan, Fergana and Andizhan.	H24 operation, alternate airport of Tashkent.	ATIS shall be provided	RCAG network of Tashkent ACC shall be completed.	Main gate-way of territory of International over flight		RCAG network of Tashkent ACC shall be completed.			
				Modernization program of ATC facilities is in progress.	ATC shall be combined with civil traffic and military traffic.				ATIS shall be provided			

Table 4.7.2 ATC Service Development at Priority Airports (3)

Item	9 Bukhara			10 Navoi			11 Urgench			12 Nukus		
	1997	2005	2020	1997	2005	2020	1997	2005	2020	1997	2005	2020
Kind of ATC	Aerodrome Control Service	Aerodrome Control Service	Aerodrome Control Service	Aerodrome Control Service	Aerodrome Control Service	Aerodrome Control Service	Aerodrome Control Service	Aerodrome Control Service	Aerodrome Control Service	Aerodrome Control Service	Aerodrome Control Service	Aerodrome Control Service
	Radar Approach Control Service	Approach Control Service	Approach Control Service	Radar Approach Control Service	Approach Control Service		Radar Approach Control Service	Approach Control Service	Approach Control Service	Radar Approach Control Service	Approach Control Service	Approach Control Service
		Radar Service	Radar Service		Radar Service			Radar Service	Radar Service	En-route Radar Control Service	En-route Control Service	En-route Control Service
											Radar Service	Radar Service
Organization ATC Position Aerodrome control	Start	Local	Local	Start	Local	Local	Start	Local	Local	Start	Local	Local
		Ground	Ground		Ground	Ground		Ground	Ground		Ground	Ground
		Supervisor	Coordinator			Coordinator		Supervisor	Coordinator		Supervisor	Coordinator
			Supervisor			Supervisor			Supervisor			Supervisor
Approach Control	Approach	Approach	Approach(divided into sectors)	Approach	Approach	(combined to Bukhara Approach Control)	Approach	Approach	Approach #divided into sectors	Approach	Approach	Approach #divided into sectors
	Circle	Departure	Departure(divided into sectors)	Circle(Landing)	Departure		Circle	Departure	Departure	Circle	Departure	Departure
	Landing	Circle	Coordinator (divided into sectors)	Supervisor	Circle		Landing	Circle	Coordinator	Landing	Circle	Coordinator
	Supervisor	Supervisor	Supervisor		Supervisor		Supervisor	Supervisor	Supervisor	Supervisor	Supervisor	Supervisor
En-route Control(ACC)										ACC(Radar) # 2 sectors	ACC(Radar) #divided into sectors	ACC(Radar) #divided into sectors
										Supervisor	Coordinator #divided into sectors	Coordinator #divided into sectors
											ADS position	ADS #divided into sectors
											Supervisor	ATM position
												Supervisor
ATC feasibility Landing/Take-off activities(peak hour)	-	(7) below max.	(7) below max.	-	(3) below max.	(5) below max.	-	(5) below max.	(8) below max.	-	(5) below max.	(6) below max.
Requirement for ICAO SARPs	-	The ATC of visual signal('light-gun')	FANS (Terminal control)	-	The ATC of visual signal('light-gun')	ATM(local center of north part)	-	The ATC of visual signal('light-gun)	FANS(Terminal control)	-	Establishment for the standard level (Terminal control)	FANS(whole en-route control)
			ATM(local center of west part)			ATN(connected to Tashkent Center)			ATN(connected to Tashkent Center)		FANS(Over flight en-route control)	FANS(Terminal control)
			ATN(connected to Tashkent Center)								The ATC of visual signal('light-gun')	ATM(local center of north-west part)
												ATN(connected to Tashkent Center)
Others	Main territorial gateway of international flights for West.	Up-graded communication lines to Samarkand, Urgench and Ashkhabad ACC in Turkmenistan.		Assistance for Tashkent ACC to Communicate with over-flight traffic.	RCAG network of Tashkent ACC shall be established.	Approach Control Services shall be combined to Bukhara Approach Control.	Modernization program of ATC facilities is in progress.	Up-graded communication lines to Samarkand, Bukhara, Nukus and Ashkahabed ACC.		H24 operation, alternate airport of Tashkent	Up-graded communication lines to Tashkent, Samarkand, Urgench and the adjacent ACCs.	
	Modernization program of ATC facilities is in progress.	ATIS shall be provided.			Up-graded communication lines to Tashkent, Samarkand, Bughara			ATIS shall be provided.			ATIS shall be provided.	
											ATC shall be combined with civil traffic and military traffic.	

4.8 Cost and Implementation Plan of Projects

4.8.1 Preliminary Cost Estimates

The summary of cost estimates for the long-term development of the priority airports is shown in **Table 4.8.1**.

Unit price for cost estimates is based on the Three Local Airports Modernization Projects, which is now being implemented on a with the soft loan scheme from Japan.

Cost items are largely classified into 7 categories, namely, airfield facilities, terminal area facilities, air navigation facilities, airport special equipment, utilities, project administration expenses, and compensation.

Airfield facilities includes earthworks and pavement of runway, taxiway and apron for overlay as well as runway extension and new runway, and other miscellaneous facilities on the airside.

Terminal facilities include passenger and cargo terminal buildings, control tower and operation building, fire and rescue station, and miscellaneous facilities on the landside.

Air navigation facilities include radio navigational aids, air traffic control facilities, meteorological facilities and airfield lighting.

Airport special equipment includes boarding bridges, baggage handling system and flight information system.

Utilities include electrical power supply, water supply, sewage treatment facilities and hot water supply. Costs for aircraft fuel supply facilities and access road are grouped in the Utilities item.

Project Administration expenses cover administration costs of NAC for implementation and survey and engineering design and supervision costs. Administration cost is assumed at 1% of the construction costs, 15% for survey and engineering design and supervision costs

Compensation means cost for land acquisition for new runway and new airport, if necessary.

As shown in **Table 4.8.1**, required amount for implementation of the long-term development of the priority airports is preliminarily estimated at US$ 2,945 millions, of which 27% is for the construction of new Tashkent Airport.

Table 4.8.1 Preliminary Cost Estimates for Long-Term Development of Priority Airports

(US$ 1,000)

Airport	Airfield Facilities	Terminal Area Facilities	Air Navigation Facilities	Airport Specila Equipment	Utilities	Project Administration Expenses	Compensation	Subtotal	Contingencies	Total	(%)
	1	2	3	4	5	6	7	8	9	10	11
[Airports]											
1. Tashkent	48,118	104,451	96,477	7,580	30,212	45,894	0	332,732	33,273	366,005	11%
2. New Tashkent	285,615	259,868	42,491	5,264	78,406	80,597	38,800	791,041	79,104	870,145	27%
3. Namangan	93,185	46,125	61,149	647	13,283	34,302	3,400	252,091	25,209	277,300	9%
4. Andizhan (Extension)	24,960	46,849	27,144	832	17,591	18,780	0	136,156	13,616	149,772	5%
5. Andizhan (New Runway)	60,823	46,849	27,144	832	17,591	24,518	0	177,757	17,776	195,533	6%
6. Fergana	76,819	54,409	61,149	832	18,529	33,878	0	245,616	24,562	270,178	8%
7. Kokand	6,077	6,855	12,450	46	1,776	4,352	1,050	32,606	3,261	35,867	1%
8. Samarkand	11,886	29,865	32,658	601	10,694	13,712	0	99,416	9,942	109,358	3%
9. Termez	13,647	59,754	60,981	739	17,586	24,433	200	177,340	17,734	195,074	6%
10. Karshi	15,353	40,522	13,451	546	13,708	13,373	0	96,953	9,695	106,648	3%
11. Bukhara	21,554	49,334	32,658	739	14,640	19,028	0	137,953	13,795	151,748	5%
12. Navoi	33,389	33,626	25,151	508	10,156	16,453		119,283	11,928	131,211	4%
13. Urgench	17,715	38,917	30,991	785	14,930	16,534	0	119,872	11,987	131,859	4%
14. Nukus	25,910	48,903	60,981	739	16,877	24,546	0	177,956	17,796	195,752	6%
[Nationwide Air Navigations System]			41,660			6,249	0	47,909	4,791	52,700	2%
(%)	25%	29%	21%	1%	9%	13%	1%	(100%)			
Total	**735,051**	**866,327**	**626,535**	**20,690**	**275,979**	**376,649**	**43,450**	**2,944,681**	**294,468**	**3,239,149**	**100%**

Note : Total amount is the sum of the above all cases.

4.8.2 Implementation Plan

Long-term development plans of the priority airports have been prepared up to the year 2020, and implementation is planned to be made basically in the following four (4) stages:

- First Stage Present - 2005
- Second Stage 2006 - 2010
- Third Stage 2011 - 2015
- Fourth Stage 2016 - 2020

Project costs by stage is shown in **Table 4.8.2**. required amount for the 1st Stage up to 2005 is estimated roughly at US$ 1,123 million, which is 40% of the total cost of the long-term development.

Table 4.8.2 Project Cost by Stages

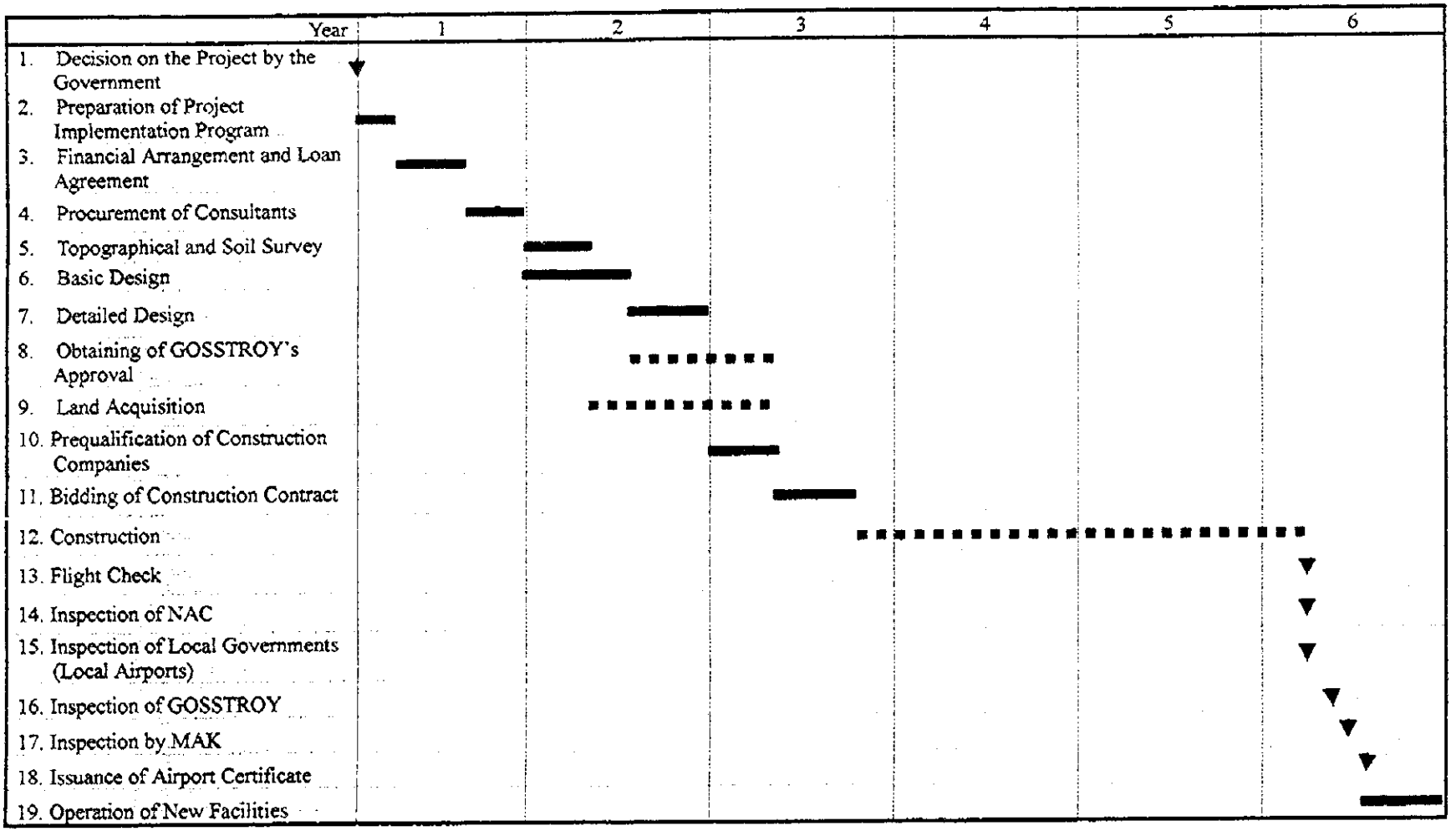
(US$ 1,000)

Airport	I	II	III	IV	Total
[Airports]					
1. Tashkent	131,210	3,495	163,636	34,401	332,732
2. New Tashkent	156,593	439,650	172,818	21,980	791,041
3. Namangan	198,126	0	18,015	35,950	252,091
4. Andizhan (Extension)	83,708	6,206	30,019	16,223	136,156
5. Andizhan (New Runway)	125,028	6,206	30,300	16,223	177,757
6. Fergana	183,257	0	26,409	35,950	245,616
7. Kokand	3,128	0	28,512	966	32,606
8. Samarkand	1,934	61,532	33,050	2,900	99,416
9. Termez	89,622	15,830	36,036	35,852	177,340
10. Karshi	12,070	83,917	0	966	96,953
11. Bukhara	1,934	61,799	58,051	16,169	137,953
12. Navoi	40,365	0	77,952	966	119,283
13. Urgench	0	58,653	53,598	7,621	119,872
14. Nukus	96,665	22,459	9,212	49,620	177,956
[Nationwide Air Navigation System]	19,164	7,186	2,395	19,164	47,909
Total	**1,142,804**	**766,933**	**740,003**	**294,951**	**2,944,681**
	40%	27%	23%	10%	100 %

Generally, implementation schedule of an airport project varies by type of works, finance arrangement, and procurement method of engineering design firms and construction companies. In Uzbekistan, regarding engineering design documents, it is necessary for an executing agency and design company to obtain technical approval from the State Design Supervision Committee (GOSSTROY), so that generally much time may be required for the design phase.

Table 4.8.3 presents a general schedule for implementing an airport project. As to the case of new airport project construction, the land acquisition and compensation to the inhabitants concerned is considered to be a key issue in order to implement the project smoothly.

Table 4.8.3 Implementation Schedule of an Airport



4.9 Preliminary Economic Analysis

4.9.1 General

Purpose of the preliminary economic analysis is to make an evaluation of the economic worth brought about in the Republic of Uzbekistan by implementing development project of the study airport.

The economic evaluation is generally made in terms of the Economic Internal Rate of Return (EIRR) on the net present value (NPV) of the Project derived from the cost-benefit analysis made from the viewpoint of the national economy.

It is general practice to make a cost-benefit analysis by the "with and without method", that is to say, comparing the case in which the project is carried out with the case in which it is not. In such an analysis, whatever positive values identified on a comparative basis as being saved or gained on account of the implementation of the project are defined as the benefits of the project.

On the other hand, any negative values accruing from the implementation the project, again on a comparative basis, are defined as the costs of the project.

In the present study, the "without project" situation is termed the Base Case as defined below.

Table 4.9.1 Concept of Cost-Benefit Analysis

	The Base Case "without the project" (b)	The Project Case "with the project" (p)	Difference (d)=(p)-(b)	EIRR (Economic Internal Rate of Return)
Costs (C)	Cb	Cp	Cd = Cp – Cb	EIRR = E ; calculating from the following formula $\sum_{t} \frac{(Bd - Cd)}{(1+E)^t} = 0$
Benefits (B)	Bb	Bp	Bd = Bp – Bb	where t = year (1, 2....)

4.9.2 Assumptions

(1) The Base Case

The Base Case, which is defined as the "without project" case of the present study, is one in which the exiting airports are to continue operating at the present facility level. In the Base Case the air traffic at almost all study airports is assumed to reach the saturation point and to remain unchanged thereafter throughout the project life.

If the Project is implemented, it can accommodate the forecast air transport demand up to the year 2020 beyond the saturation point in the Base Case. **Fig.4.9.1** presents the above situation in a graphic form.

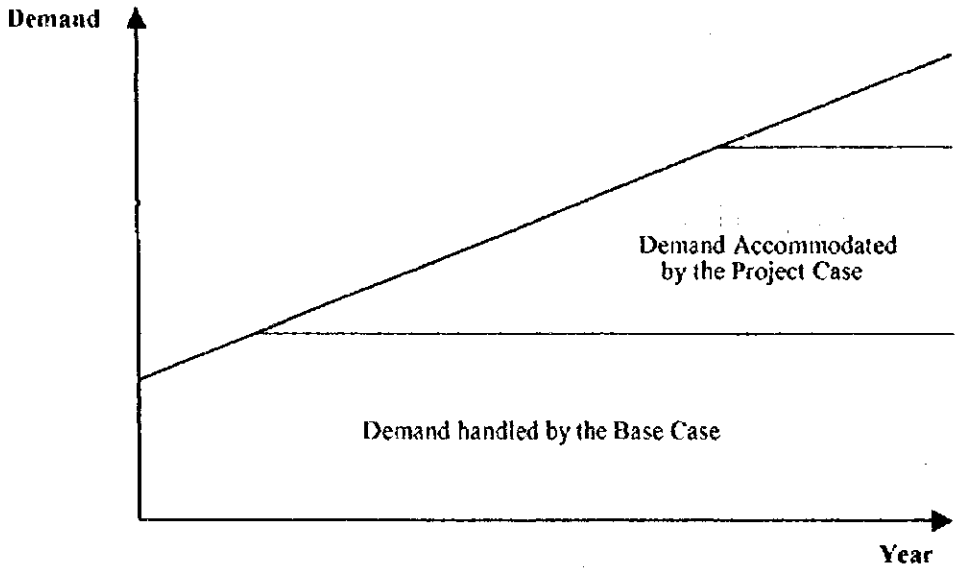


Fig. 4.9.1 Base Case and Overflowing Demand

(2) Project Life

The project life is assumed to be 20 years following the opening in 2020 of all facilities, and the costs and benefits of the Project and those of the Base Case, which are both calculated in US$ on the basis of the actual prices prevailing in 1997, are measured for the said project life to 2039.

(3) Maintenance and Operation Costs

Estimates of the costs of the annual maintenance and operation of the Project and Base Case for the assumed project life of 20 years are made in the following manner.

- Maintenance Cost of Facilities ------- 3 % of the investment costs
- Operation Cost of Airport ---------- 0.25 US$ thou. per m2

(4) Economic Benefits

The economic benefits considered attributable to the Project from the viewpoint of the national economy of Uzbekistan comprise the direct (primary) benefits and the indirect (secondary) benefits.

a) Direct Benefits

- **Net Increase in Tourist Income**

The international air passenger transport demand at the study airports will overflow in the Base Case, and such overflowing air passengers would be forced to give up their trip. Those overflowing international air passengers who would give up their trip in the Base Case could be accommodated by the airports if the Project were implemented.

The average tourist expenditures per capita, according to the market research conducted by Uzbek Tourism, are 500 US$ in 1996.

On the basis of the above considerations, the net increase of the tourist income attributable to the implementation of the Project is estimated.

- **Airport Revenue Increments**

Assuming that 50% of all aircraft movements of international flights will be of foreign airlines, the incremental airport revenues that would be paid by foreign airlines if the Project is implemented, are considered to be the economic benefits of the Project in terms of foreign exchange earnings, along with the expected increase in international passenger service charges. The incremental airport revenues are estimated on the basis of the current airport tariff.

- Landing charges 13 US$ per ton of an aircraft's maximum take-off weight
- Other charges 20 % of Landing charge
- Passenger charges 10 US$ for each passenger leaving the country

- **Travel Time Saving**

The overflowing Uzbek air passengers going on a trips would have to switch to the surface transport mode, such as railways or roads in order to reach their destinations or neighboring international airports for transfer. Such travel time lost by Uzbek would be saved by the implementation of the Project, comprising economic benefits to the Uzbek economy attributable to the Project. Theoretically speaking, such benefits could be estimated in monetary terms by using the concept of time value.

The average time value of Uzbek was applied based on average monthly wage and working hours of workers and employees.

- Average Time Value 0.25 US$ in respect of each passenger

- **Increase of Comfort and Convenience**

The service level of the terminal area facilities will particularly be much improved by the implementation of the Project as compared with that of the Base Case. Air passengers will derive increased comfort and convenience from the improved facilities in the passenger terminal building.

The Project will also reduce the average handling time of air cargo, at the same time reducing the occurrence of possible damage or decay of air cargo, by the renewal of air cargo terminal building.

These advantages may well be termed direct benefits enjoyed by the airport users, but are not counted in the present study because of the difficulty of their quantification.

b) Indirect Benefits

- **Employment Effect**

The airports development Project is expected to contribute to increasing the national income of Uzbekistan by providing increased employment opportunities both during and after the construction of the facilities.

These benefits are quantifiable, but have been treated as indirect benefits, and consequently no calculation thereof is made in the present study.

- **Multiplier Economic Effect**

  The Project will cause multiplier effects on the Uzbek economy as a whole through increased procurement of goods and services related to the construction and maintenance of the facilities.

  These effects could be quantitatively identified through the input-output analysis, which, however , is considered outside the scope of the present study.

4.9.3 Economic Evaluation

Cost-benefit analysis is made on the basis of the cash flow of the economic costs and the direct tangible economic benefits obtained through comparison between the Base Case and the Project Case as discussed above.

The economic internal rate of return (EIRR) for the each airport was obtained as shown through **Table 4.9.2** to **Table 4.9.15**.

Tab.4.9.2 Cash Flow of Economic Costs and Benefits [Tashkent] (US$ thou.)

Year	Cost			Revenue			Net Economic Benefits
	Base Case	Project Case	Increment Cost	Base Case	Project Case	Increment Revenue	
2000	10,605	15,130	4,525	155,149	155,149	0	-4,525
2001	10,605	15,130	4,525	167,544	167,544	0	-4,525
2002	10,605	51,325	40,720	179,942	179,942	0	-40,720
2003	10,605	51,325	40,720	192,341	192,341	0	-40,720
2004	10,605	51,325	40,720	204,744	204,744	0	-40,720
2005	10,605	10,339	-266	226,420	226,495	75	340
2006	10,605	10,339	-266	240,050	240,205	155	421
2007	10,605	11,845	1,240	253,683	253,919	236	-1,005
2008	10,605	11,845	1,240	267,318	267,635	316	-924
2009	10,605	10,218	-387	267,318	281,354	14,036	14,422
2010	10,605	15,951	5,346	267,318	301,108	33,789	28,444
2011	10,605	15,951	5,346	267,318	316,412	49,093	43,748
2012	10,605	61,090	50,485	267,318	331,718	64,400	13,915
2013	10,605	61,090	50,485	267,318	347,027	79,708	29,224
2014	10,605	61,090	50,485	267,318	362,338	95,020	44,535
2015	10,605	15,726	5,121	267,318	380,713	113,395	108,274
2016	10,605	15,652	5,047	267,318	396,771	129,453	124,405
2017	10,605	30,591	19,986	267,318	412,829	145,510	125,524
2018	10,605	30,591	19,986	267,318	428,887	161,568	141,582
2019	10,605	14,540	3,935	267,318	444,945	177,626	173,691
2020	10,605	15,430	4,825	267,318	461,003	193,684	188,859
2021	10,605	15,430	4,825	267,318	478,434	211,116	206,291
2022	10,605	15,430	4,825	267,318	495,866	228,547	223,722
2023	10,605	15,430	4,825	267,318	513,297	245,979	241,154
2024	10,605	15,430	4,825	267,318	513,297	245,979	241,154
2025	10,605	15,430	4,825	267,318	513,297	245,979	241,154
2026	10,605	15,430	4,825	267,318	513,297	245,979	241,154
2027	10,605	15,430	4,825	267,318	513,297	245,979	241,154
2028	10,605	15,430	4,825	267,318	513,297	245,979	241,154
2029	10,605	15,430	4,825	267,318	513,297	245,979	241,154
2030	10,605	15,430	4,825	267,318	513,297	245,979	241,154
2031	10,605	15,430	4,825	267,318	513,297	245,979	241,154
2032	10,605	15,430	4,825	267,318	513,297	245,979	241,154
2033	10,605	15,430	4,825	267,318	513,297	245,979	241,154
2034	10,605	15,430	4,825	267,318	513,297	245,979	241,154
2035	10,605	15,430	4,825	267,318	513,297	245,979	241,154
2036	10,605	15,430	4,825	267,318	513,297	245,979	241,154
2037	10,605	15,430	4,825	267,318	513,297	245,979	241,154
2038	10,605	15,430	4,825	267,318	513,297	245,979	241,154
2039	10,605	15,430	4,825	267,318	513,297	245,979	241,154
Total	424,200	869,699	445,499	10,174,063	16,053,431	5,879,368	5,433,869

EIRR = 20.50%

Tab.4.9.3 Cash Flow of Economic Costs and Benefits { New Tashkent } (US$ thou.)

Year	Cost			Revenue			Net Economic Benefits
	Base Case	Project Case	Increment Cost	Base Case	Project Case	Increment Revenue	
2000	10,605	22,596	11,991	155,149	154,961	-188	-12,179
2001	10,605	35,525	24,920	167,544	167,359	-185	-25,105
2002	10,605	71,726	61,121	179,942	179,761	-181	-61,302
2003	10,605	71,691	61,086	192,341	192,165	-176	-61,262
2004	10,605	139,292	128,687	204,744	204,573	-171	-128,858
2005	10,605	96,048	85,443	226,420	226,330	-91	-85,534
2006	10,605	96,048	85,443	240,050	240,106	56	-85,387
2007	10,605	96,048	85,443	253,683	253,895	212	-85,231
2008	10,605	96,048	85,443	267,318	267,695	376	-85,067
2009	10,605	96,048	85,443	267,318	281,507	14,189	-71,255
2010	10,605	34,185	23,580	267,318	301,377	34,059	10,479
2011	10,605	34,185	23,580	267,318	316,652	49,333	25,753
2012	10,605	102,521	91,916	267,318	331,927	64,609	-27,307
2013	10,605	102,521	91,916	267,318	347,203	79,884	-12,031
2014	10,605	102,521	91,916	267,318	362,480	95,162	3,246
2015	10,605	35,140	24,535	267,318	380,813	113,494	88,959
2016	10,605	35,140	24,535	267,318	396,911	129,592	105,057
2017	10,605	52,499	41,894	267,318	413,010	145,692	103,798
2018	10,605	52,499	41,894	267,318	429,111	161,792	119,898
2019	10,605	42,099	31,494	267,318	445,213	177,895	146,400
2020	10,605	34,904	24,299	267,318	461,308	193,990	169,690
2021	10,605	34,904	24,299	267,318	478,759	211,441	187,141
2022	10,605	34,904	24,299	267,318	496,203	228,884	204,585
2023	10,605	34,904	24,299	267,318	513,646	246,328	222,028
2024	10,605	34,904	24,299	267,318	531,090	263,771	239,472
2025	10,605	34,904	24,299	267,318	548,533	281,215	256,915
2026	10,605	34,904	24,299	267,318	548,533	281,215	256,915
2027	10,605	34,904	24,299	267,318	548,533	281,215	256,915
2028	10,605	34,904	24,299	267,318	548,533	281,215	256,915
2029	10,605	34,904	24,299	267,318	548,533	281,215	256,915
2030	10,605	34,904	24,299	267,318	548,533	281,215	256,915
2031	10,605	34,904	24,299	267,318	548,533	281,215	256,915
2032	10,605	34,904	24,299	267,318	548,533	281,215	256,915
2033	10,605	34,904	24,299	267,318	548,533	281,215	256,915
2034	10,605	34,904	24,299	267,318	548,533	281,215	256,915
2035	10,605	34,904	24,299	267,318	548,533	281,215	256,915
2036	10,605	34,904	24,299	267,318	548,533	281,215	256,915
2037	10,605	34,904	24,299	267,318	548,533	281,215	256,915
2038	10,605	34,904	24,299	267,318	548,533	281,215	256,915
2039	10,605	34,904	24,299	267,318	548,533	281,215	256,915
Total	424,200	2,112,471	1,688,271	10,174,063	16,602,051	6,427,988	4,739,717

EIRR = 10.01%

Table 4.9.4 Cash Flow of Economic Costs and Benefits [Namangan] (US$ thou.)

Year	Cost			Revenue			Net Economic Benefits
	Base Case	Project Case	Increment Cost	Base Case	Project Case	Increment Revenue	
2000	1,055	9,470	8,415	833	833	0	-8,415
2001	1,055	9,470	8,415	893	893	0	-8,415
2002	1,055	61,487	60,432	954	954	0	-60,432
2003	1,055	61,487	60,432	1,015	1,015	0	-60,432
2004	1,055	61,487	60,432	1,076	1,076	0	-60,432
2005	1,055	7,766	6,711	1,136	13,305	12,169	5,457
2006	1,055	7,766	6,711	1,185	14,195	13,010	6,299
2007	1,055	7,766	6,711	1,233	15,084	13,851	7,140
2008	1,055	7,766	6,711	1,281	15,975	14,693	7,982
2009	1,055	7,766	6,711	1,329	16,865	15,535	8,824
2010	1,055	8,387	7,332	1,378	17,756	16,378	9,046
2011	1,055	8,387	7,332	1,431	18,709	17,278	9,946
2012	1,055	24,539	23,484	1,484	19,662	18,178	-5,306
2013	1,055	7,766	6,711	1,537	20,616	19,079	12,367
2014	1,055	7,766	6,711	1,590	21,570	19,980	13,268
2015	1,055	9,682	8,627	1,643	22,523	20,880	12,253
2016	1,055	9,682	8,627	1,701	23,601	21,900	13,273
2017	1,055	25,177	24,122	1,758	24,679	22,921	-1,201
2018	1,055	25,177	24,122	1,815	25,756	23,940	-182
2019	1,055	8,442	7,387	1,873	26,834	24,961	17,574
2020	1,055	9,372	8,317	1,930	27,911	25,981	17,664
2021	1,055	9,372	8,317	1,979	28,967	26,988	18,671
2022	1,055	9,372	8,317	2,027	30,021	27,994	19,677
2023	1,055	9,372	8,317	2,076	31,076	29,000	20,683
2024	1,055	9,372	8,317	2,076	32,130	30,054	21,737
2025	1,055	9,372	8,317	2,076	33,185	31,109	22,792
2026	1,055	9,372	8,317	2,076	34,293	32,217	23,900
2027	1,055	9,372	8,317	2,076	35,352	33,276	24,959
2028	1,055	9,372	8,317	2,076	36,410	34,334	26,017
2029	1,055	9,372	8,317	2,076	37,469	35,393	27,076
2030	1,055	9,372	8,317	2,076	38,527	36,451	28,134
2031	1,055	9,372	8,317	2,076	39,646	37,571	29,254
2032	1,055	9,372	8,317	2,076	40,766	38,690	30,373
2033	1,055	9,372	8,317	2,076	41,885	39,809	31,492
2034	1,055	9,372	8,317	2,076	43,004	40,928	32,611
2035	1,055	9,372	8,317	2,076	44,124	42,048	33,731
2036	1,055	9,372	8,317	2,076	45,305	43,229	34,912
2037	1,055	9,372	8,317	2,076	46,486	44,410	36,093
2038	1,055	9,372	8,317	2,076	47,667	45,591	37,274
2039	1,055	9,372	8,317	2,076	48,848	46,772	38,455
Total	42,190	564,667	522,477	68,371	1,064,968	996,597	474,120

EIRR = 5.58%

Table 4.9.5 Cash Flow of Economic Costs and Benefits [Andizhan-1] (US$ thou.)

Year	Cost			Revenue			Net Economic Benefits
	Base Case	Project Case	Increment Cost	Base Case	Project Case	Increment Revenue	
2000	1,038	3,925	2,887	1,671	1,671	0	-2,887
2001	1,038	3,925	2,887	1,766	1,766	0	-2,887
2002	1,038	27,017	25,979	1,862	1,862	0	-25,979
2003	1,038	27,017	25,979	1,957	1,957	0	-25,979
2004	1,038	27,016	25,978	2,052	2,052	0	-25,978
2005	1,038	5,533	4,495	2,052	16,328	14,277	9,781
2006	1,038	10,883	9,845	2,052	17,394	15,343	5,497
2007	1,038	5,105	4,067	2,052	18,460	16,408	12,341
2008	1,038	5,105	4,067	2,052	19,525	17,473	13,406
2009	1,038	5,105	4,067	2,052	20,590	18,538	14,471
2010	1,038	6,300	5,263	2,052	21,655	19,603	14,340
2011	1,038	6,300	5,263	2,052	22,876	20,825	15,562
2012	1,038	19,239	18,202	2,052	24,098	22,046	3,844
2013	1,038	19,239	18,202	2,052	25,319	23,268	5,066
2014	1,038	5,265	4,228	2,052	26,541	24,490	20,262
2015	1,038	8,001	6,963	2,052	27,764	25,713	18,749
2016	1,038	8,001	6,963	2,052	28,978	26,927	19,963
2017	1,038	13,875	12,837	2,052	30,193	28,141	15,304
2018	1,038	13,875	12,837	2,052	31,406	29,354	16,517
2019	1,038	6,882	5,844	2,052	32,620	30,568	24,724
2020	1,038	7,301	6,264	2,052	33,833	31,782	25,518
2021	1,038	7,301	6,264	2,052	35,098	33,046	26,782
2022	1,038	7,301	6,264	2,052	36,360	34,308	28,044
2023	1,038	7,301	6,264	2,052	37,622	35,570	29,306
2024	1,038	7,301	6,264	2,052	38,883	36,832	30,568
2025	1,038	7,301	6,264	2,052	40,145	38,093	31,830
2026	1,038	7,301	6,264	2,052	41,472	39,420	33,156
2027	1,038	7,301	6,264	2,052	42,799	40,747	34,483
2028	1,038	7,301	6,264	2,052	44,125	42,074	35,810
2029	1,038	7,301	6,264	2,052	45,452	43,400	37,136
2030	1,038	7,301	6,264	2,052	46,779	44,727	38,463
2031	1,038	7,301	6,264	2,052	48,179	46,127	39,863
2032	1,038	7,301	6,264	2,052	49,579	47,527	41,264
2033	1,038	7,301	6,264	2,052	50,979	48,928	42,664
2034	1,038	7,301	6,264	2,052	52,285	50,234	43,970
2035	1,038	7,301	6,264	2,052	53,592	51,540	45,276
2036	1,038	7,301	6,264	2,052	54,970	52,918	46,654
2037	1,038	7,301	6,264	2,052	56,348	54,297	48,033
2038	1,038	7,301	6,264	2,052	57,727	55,675	49,411
2039	1,038	7,301	6,264	2,052	59,105	57,053	50,789
Total	41,500	373,631	332,131	81,116	1,298,387	1,217,271	885,140

EIRR = 14.64%

Table 4.9.6 Cash Flow of Economic Costs and Benefits [Andizhan-2] (US$ thou.)

Year	Cost			Revenue			Net Economic Benefits
	Base Case	Project Case	Increment Cost	Base Case	Project Case	Increment Revenue	
2000	1,038	5,349	4,311	1,671	1,671	0	-4,311
2001	1,038	5,349	4,311	1,766	1,766	0	-4,311
2002	1,038	39,840	38,802	1,862	1,862	0	-38,802
2003	1,038	39,840	38,802	1,957	1,957	0	-38,802
2004	1,038	39,840	38,802	2,052	2,052	0	-38,802
2005	1,038	6,601	5,564	2,052	16,328	14,277	8,713
2006	1,038	11,951	10,914	2,052	17,394	15,343	4,429
2007	1,038	6,173	5,136	2,052	18,460	16,408	11,272
2008	1,038	6,173	5,136	2,052	19,525	17,473	12,337
2009	1,038	6,173	5,136	2,052	20,590	18,538	13,402
2010	1,038	7,379	6,341	2,052	21,655	19,603	13,262
2011	1,038	7,379	6,341	2,052	22,876	20,825	14,483
2012	1,038	20,439	19,401	2,052	24,098	22,046	2,645
2013	1,038	20,439	19,401	2,052	25,319	23,268	3,866
2014	1,038	6,334	5,296	2,052	26,541	24,490	19,193
2015	1,038	9,077	8,039	2,052	27,764	25,713	17,674
2016	1,038	9,077	8,039	2,052	28,978	26,927	18,888
2017	1,038	14,951	13,913	2,052	30,193	28,141	14,228
2018	1,038	14,951	13,913	2,052	31,406	29,354	15,441
2019	1,038	7,958	6,920	2,052	32,620	30,568	23,648
2020	1,038	8,377	7,340	2,052	33,833	31,782	24,442
2021	1,038	8,377	7,340	2,052	35,098	33,046	25,707
2022	1,038	8,377	7,340	2,052	36,360	34,308	26,968
2023	1,038	8,377	7,340	2,052	37,622	35,570	28,230
2024	1,038	8,377	7,340	2,052	38,883	36,832	29,492
2025	1,038	8,377	7,340	2,052	40,145	38,093	30,754
2026	1,038	8,377	7,340	2,052	41,472	39,420	32,080
2027	1,038	8,377	7,340	2,052	42,799	40,747	33,407
2028	1,038	8,377	7,340	2,052	44,125	42,074	34,734
2029	1,038	8,377	7,340	2,052	45,452	43,400	36,061
2030	1,038	8,377	7,340	2,052	46,779	44,727	37,387
2031	1,038	8,377	7,340	2,052	48,179	46,127	38,787
2032	1,038	8,377	7,340	2,052	49,579	47,527	40,188
2033	1,038	8,377	7,340	2,052	50,979	48,928	41,588
2034	1,038	8,377	7,340	2,052	52,285	50,234	42,894
2035	1,038	8,377	7,340	2,052	53,592	51,540	44,200
2036	1,038	8,377	7,340	2,052	54,970	52,918	45,579
2037	1,038	8,377	7,340	2,052	56,348	54,297	46,957
2038	1,038	8,377	7,340	2,052	57,727	55,675	48,335
2039	1,038	8,377	7,340	2,052	59,105	57,053	49,714
Total	41,500	452,814	411,314	81,116	1,298,387	1,217,271	805,957

EIRR = 10.71%

Table 4.9.7 Cash Flow of Economic Costs and Benefits [Fergana] (US$ thou.)

Year	Cost			Revenue			Net Economic Benefits
	Base Case	Project Case	Increment Cost	Base Case	Project Case	Increment Revenue	
2000	1,075	7,394	6,319	1,500	1,500	0	-6,319
2001	1,075	7,394	6,319	1,564	1,564	0	-6,319
2002	1,075	57,948	56,873	1,628	1,628	0	-56,873
2003	1,075	57,948	56,873	1,693	1,693	0	-56,873
2004	1,075	57,948	56,873	1,757	1,757	0	-56,873
2005	1,075	7,679	6,604	1,821	21,699	19,878	13,273
2006	1,075	7,679	6,604	1,913	23,331	21,418	14,813
2007	1,075	7,679	6,604	2,004	24,963	22,959	16,354
2008	1,075	7,679	6,604	2,096	26,596	24,500	17,896
2009	1,075	7,679	6,604	2,096	28,228	26,133	19,528
2010	1,075	8,590	7,515	2,096	29,861	27,765	20,250
2011	1,075	8,590	7,515	2,096	31,349	29,253	21,738
2012	1,075	19,973	18,898	2,096	32,838	30,742	11,844
2013	1,075	19,973	18,898	2,096	34,328	32,232	13,334
2014	1,075	7,679	6,604	2,096	35,819	33,723	27,119
2015	1,075	10,442	9,367	2,096	37,309	35,214	25,846
2016	1,075	10,442	9,367	2,096	39,131	37,035	27,668
2017	1,075	25,937	24,862	2,096	40,953	38,858	13,995
2018	1,075	25,937	24,862	2,096	42,776	40,680	15,818
2019	1,075	9,202	8,127	2,096	44,599	42,503	34,376
2020	1,075	10,132	9,057	2,096	46,421	44,325	35,268
2021	1,075	10,132	9,057	2,096	48,167	46,072	37,015
2022	1,075	10,132	9,057	2,096	49,911	47,815	38,758
2023	1,075	10,132	9,057	2,096	51,655	49,559	40,502
2024	1,075	10,132	9,057	2,096	53,399	51,303	42,246
2025	1,075	10,132	9,057	2,096	55,143	53,047	43,990
2026	1,075	10,132	9,057	2,096	56,972	54,876	45,819
2027	1,075	10,132	9,057	2,096	58,801	56,705	47,648
2028	1,075	10,132	9,057	2,096	60,630	58,535	49,477
2029	1,075	10,132	9,057	2,096	62,459	60,364	51,307
2030	1,075	10,132	9,057	2,096	64,289	62,193	53,136
2031	1,075	10,132	9,057	2,096	66,210	64,115	55,057
2032	1,075	10,132	9,057	2,096	68,132	66,036	56,979
2033	1,075	10,132	9,057	2,096	70,054	67,958	58,901
2034	1,075	10,132	9,057	2,096	71,975	69,880	60,823
2035	1,075	10,132	9,057	2,096	73,897	71,801	62,744
2036	1,075	10,132	9,057	2,096	75,911	73,815	64,758
2037	1,075	10,132	9,057	2,096	77,925	75,829	66,772
2038	1,075	10,132	9,057	2,096	79,854	77,759	68,702
2039	1,075	10,132	9,057	2,096	81,784	79,689	70,632
Total	43,000	576,440	533,440	80,940	1,775,509	1,694,569	1,161,129

EIRR = 11.01%

Table 4.9.8 Cash Flow of Economic Costs and Benefits [Kokand] (US$ thou.)

Year	Cost			Revenue			Net Economic Benefits
	Base Case	Project Case	Increment Cost	Base Case	Project Case	Increment Revenue	
2000	80	1,202	1,122	57	57	0	-1,122
2001	80	2,086	2,006	59	59	0	-2,006
2002	80	80	0	61	61	0	0
2003	80	80	0	63	63	0	0
2004	80	80	0	65	65	0	0
2005	80	134	54	67	67	0	-54
2006	80	134	54	69	69	0	-54
2007	80	134	54	71	71	0	-54
2008	80	134	54	73	73	0	-54
2009	80	134	54	75	75	0	-54
2010	80	1,247	1,166	77	77	0	-1,166
2011	80	1,247	1,166	99	99	0	-1,166
2012	80	13,537	13,456	121	121	0	-13,456
2013	80	13,537	13,456	143	143	0	-13,456
2014	80	264	183	143	165	22	-161
2015	80	1,034	954	143	187	44	-910
2016	80	1,934	1,854	143	193	50	-1,804
2017	80	1,001	921	143	199	55	-865
2018	80	1,001	921	143	204	61	-860
2019	80	1,001	921	143	210	67	-854
2020	80	1,026	946	143	215	72	-873
2021	80	1,026	946	143	221	78	-868
2022	80	1,026	946	143	226	83	-863
2023	80	1,026	946	143	232	89	-857
2024	80	1,026	946	143	237	94	-852
2025	80	1,026	946	143	243	100	-846
2026	80	1,026	946	143	248	105	-841
2027	80	1,026	946	143	254	111	-835
2028	80	1,026	946	143	259	116	-829
2029	80	1,026	946	143	265	122	-824
2030	80	1,026	946	143	271	128	-818
2031	80	1,026	946	143	276	133	-813
2032	80	1,026	946	143	282	139	-807
2033	80	1,026	946	143	288	145	-801
2034	80	1,026	946	143	294	151	-795
2035	80	1,026	946	143	299	156	-790
2036	80	1,026	946	143	305	162	-784
2037	80	1,026	946	143	311	168	-778
2038	80	1,026	946	143	317	174	-772
2039	80	1,026	946	143	322	179	-766
Total	3,210	60,524	57,314	4,817	7,621	2,804	-54,510

EIRR = invalid

Table 4.9.9 Cash Flow of Economic Costs and Benefits { Samarkand } (US$ thou.)

Year	Cost			Revenue			Net Economic Benefits
	Base Case	Project Case	Increment Cost	Base Case	Project Case	Increment Revenue	
2000	1,723	1,790	67	16,053	16,053	0	-67
2001	1,723	3,590	1,867	17,301	17,301	0	-1,867
2002	1,723	1,723	0	18,551	18,551	0	0
2003	1,723	1,723	0	19,800	19,800	0	0
2004	1,723	1,723	0	21,050	21,050	0	0
2005	1,723	3,895	2,172	22,303	22,303	0	-2,172
2006	1,723	3,895	2,172	24,033	24,033	0	-2,172
2007	1,723	20,869	19,146	25,762	25,762	0	-19,146
2008	1,723	20,869	19,146	27,489	27,489	0	-19,146
2009	1,723	20,869	19,146	29,214	29,214	0	-19,146
2010	1,723	5,511	3,789	30,939	30,939	0	-3,789
2011	1,723	5,511	3,789	32,785	32,785	0	-3,789
2012	1,723	19,756	18,034	34,632	34,632	0	-18,034
2013	1,723	19,756	18,034	36,480	36,480	0	-18,034
2014	1,723	4,371	2,649	36,511	38,329	1,818	-830
2015	1,723	5,426	3,704	36,541	40,179	3,638	-65
2016	1,723	7,926	6,204	36,589	41,883	5,295	-909
2017	1,723	5,226	3,504	36,637	43,588	6,952	3,448
2018	1,723	5,226	3,504	36,684	45,294	8,609	5,106
2019	1,723	5,226	3,504	36,732	46,999	10,267	6,763
2020	1,723	5,301	3,579	36,780	48,703	11,923	8,345
2021	1,723	5,301	3,579	36,780	50,529	13,749	10,170
2022	1,723	5,301	3,579	36,780	52,352	15,572	11,993
2023	1,723	5,301	3,579	36,780	54,175	17,395	13,817
2024	1,723	5,301	3,579	36,780	55,999	19,219	15,640
2025	1,723	5,301	3,579	36,780	57,822	21,042	17,463
2026	1,723	5,301	3,579	36,780	59,735	22,955	19,376
2027	1,723	5,301	3,579	36,780	61,648	24,868	21,289
2028	1,723	5,301	3,579	36,780	63,561	26,781	23,202
2029	1,723	5,301	3,579	36,780	65,474	28,694	25,115
2030	1,723	5,301	3,579	36,780	67,387	30,607	27,028
2031	1,723	5,301	3,579	36,780	69,398	32,618	29,039
2032	1,723	5,301	3,579	36,780	71,409	34,629	31,050
2033	1,723	5,301	3,579	36,780	73,420	36,640	33,061
2034	1,723	5,301	3,579	36,780	75,431	38,651	35,072
2035	1,723	5,301	3,579	36,780	77,442	40,662	37,083
2036	1,723	5,301	3,579	36,780	79,551	42,771	39,192
2037	1,723	5,301	3,579	36,780	81,660	44,880	41,301
2038	1,723	5,301	3,579	36,780	83,769	46,989	43,410
2039	1,723	5,301	3,579	36,780	85,878	49,098	45,519
Total	68,900	270,900	202,000	1,311,688	1,948,007	636,319	434,319

EIRR = 7.95%

Table 4.9.10 Cash Flow of Economic Costs and Benefits [Termez] (US$ thou.)

Year	Cost			Revenue			Net Economic Benefits
	Base Case	Project Case	Increment Cost	Base Case	Project Case	Increment Revenue	
2000	550	3,634	3,084	877	877	0	-3,084
2001	550	3,834	3,284	919	919	0	-3,284
2002	550	28,302	27,752	960	960	0	-27,752
2003	550	28,302	27,752	1,001	1,001	0	-27,752
2004	550	28,301	27,751	1,043	1,043	0	-27,751
2005	550	4,539	3,989	1,084	8,332	7,248	3,259
2006	550	4,539	3,989	1,084	8,896	7,811	3,823
2007	550	11,363	10,813	1,084	9,459	8,375	-2,438
2008	550	11,363	10,813	1,084	10,023	8,939	-1,874
2009	550	3,993	3,443	1,084	10,587	9,503	6,060
2010	550	5,645	5,095	1,084	12,004	10,919	5,824
2011	550	5,645	5,095	1,084	12,631	11,547	6,452
2012	550	21,177	20,627	1,084	13,260	12,176	-8,451
2013	550	21,177	20,627	1,084	13,887	12,803	-7,824
2014	550	4,402	3,852	1,084	14,515	13,431	9,579
2015	550	8,250	7,700	1,084	15,142	14,058	6,358
2016	550	8,250	7,700	1,084	15,801	14,717	7,017
2017	550	23,704	23,154	1,084	16,461	15,377	-7,777
2018	550	23,704	23,154	1,084	17,120	16,036	-7,118
2019	550	7,014	6,464	1,084	17,780	16,696	10,232
2020	550	7,941	7,391	1,084	18,440	17,356	9,965
2021	550	7,941	7,391	1,084	19,128	18,044	10,652
2022	550	7,941	7,391	1,084	19,814	18,730	11,339
2023	550	7,941	7,391	1,084	20,501	19,417	12,026
2024	550	7,941	7,391	1,084	21,188	20,103	12,712
2025	550	7,941	7,391	1,084	21,874	20,790	13,399
2026	550	7,941	7,391	1,084	22,596	21,512	14,120
2027	550	7,941	7,391	1,084	23,317	22,233	14,842
2028	550	7,941	7,391	1,084	24,039	22,955	15,564
2029	550	7,941	7,391	1,084	24,761	23,677	16,285
2030	550	7,941	7,391	1,084	25,483	24,398	17,007
2031	550	7,941	7,391	1,084	26,244	25,160	17,768
2032	550	7,941	7,391	1,084	27,005	25,921	18,529
2033	550	7,941	7,391	1,084	27,766	26,682	19,291
2034	550	7,941	7,391	1,084	28,527	27,443	20,052
2035	550	7,941	7,391	1,084	29,288	28,204	20,813
2036	550	7,941	7,391	1,084	30,089	29,005	21,614
2037	550	7,941	7,391	1,084	30,891	29,807	22,415
2038	550	7,941	7,391	1,084	31,692	30,608	23,217
2039	550	7,941	7,391	1,084	32,493	31,409	24,018
Total	22,000	415,961	393,961	42,747	705,835	663,088	269,127

EIRR = 5.66%

Table 4.9.11 Cash Flow of Economic Costs and Benefits [Karshi] (US$ thou.)

Year	Cost			Revenue			Net Economic Benefits
	Base Case	Project Case	Increment Cost	Base Case	Project Case	Increment Revenue	
2000	600	1,016	416	391	391	0	-416
2001	600	12,254	11,654	426	426	0	-11,654
2002	600	600	0	462	462	0	0
2003	600	600	0	498	498	0	0
2004	600	600	0	533	533	0	0
2005	600	3,806	3,206	569	569	0	-3,206
2006	600	3,806	3,206	593	593	0	-3,206
2007	600	26,955	26,355	617	617	0	-26,355
2008	600	26,955	26,355	642	642	0	-26,355
2009	600	26,955	26,355	666	666	0	-26,355
2010	600	5,212	4,612	690	16,203	15,513	10,900
2011	600	5,212	4,612	716	17,080	16,364	11,751
2012	600	5,212	4,612	743	17,957	17,214	12,602
2013	600	5,212	4,612	769	18,833	18,064	13,451
2014	600	5,212	4,612	795	19,709	18,913	14,301
2015	600	5,279	4,679	822	20,585	19,763	15,084
2016	600	6,112	5,512	850	21,593	20,743	15,230
2017	600	5,212	4,612	879	22,601	21,722	17,110
2018	600	5,212	4,612	907	23,609	22,702	18,089
2019	600	5,212	4,612	935	24,617	23,682	19,069
2020	600	5,237	4,637	935	25,624	24,688	20,051
2021	600	5,237	4,637	935	26,604	25,669	21,031
2022	600	5,237	4,637	935	27,583	26,647	22,010
2023	600	5,237	4,637	935	28,561	27,626	22,989
2024	600	5,237	4,637	935	29,540	28,605	23,967
2025	600	5,237	4,637	935	30,519	29,583	24,946
2026	600	5,237	4,637	935	31,549	30,614	25,976
2027	600	5,237	4,637	935	32,579	31,644	27,006
2028	600	5,237	4,637	935	33,609	32,674	28,036
2029	600	5,237	4,637	935	34,639	33,704	29,067
2030	600	5,237	4,637	935	35,670	34,734	30,097
2031	600	5,237	4,637	935	36,758	35,823	31,185
2032	600	5,237	4,637	935	37,847	36,911	32,274
2033	600	5,237	4,637	935	38,935	38,000	33,362
2034	600	5,237	4,637	935	40,024	39,088	34,451
2035	600	5,237	4,637	935	41,112	40,177	35,539
2036	600	5,237	4,637	935	42,260	41,324	36,687
2037	600	5,237	4,637	935	43,407	42,472	37,835
2038	600	5,237	4,637	935	44,529	43,594	38,956
2039	600	5,237	4,637	935	45,651	44,715	40,078
Total	24,000	261,387	237,387	32,213	915,183	882,971	645,584

EIRR = 12.81%

Table 4.9.12 Cash Flow of Economic Costs and Benefits [Bukhara] (US$ thou.)

Year	Cost			Revenue			Net Economic Benefits
	Base Case	Project Case	Increment Cost	Base Case	Project Case	Increment Revenue	
2000	1,513	1,780	267	10,379	10,379	0	-267
2001	1,513	3,180	1,667	11,527	11,527	0	-1,667
2002	1,513	1,513	0	12,675	12,675	0	0
2003	1,513	1,513	0	13,823	13,823	0	0
2004	1,513	1,513	0	14,971	14,971	0	0
2005	1,513	3,694	2,181	16,120	16,418	299	-1,882
2006	1,513	3,694	2,181	17,314	17,636	321	-1,860
2007	1,513	20,742	19,229	18,509	18,853	344	-18,885
2008	1,513	20,742	19,229	19,704	20,071	367	-18,862
2009	1,513	20,742	19,229	20,899	21,289	390	-18,839
2010	1,513	6,380	4,868	22,063	22,506	444	-4,424
2011	1,513	6,380	4,868	23,048	23,546	497	-4,370
2012	1,513	22,394	20,882	24,034	24,585	551	-20,331
2013	1,513	22,394	20,882	25,020	25,625	605	-20,277
2014	1,513	22,394	20,882	26,006	26,664	658	-20,224
2015	1,513	6,438	4,925	26,992	27,703	712	-4,213
2016	1,513	6,438	4,925	28,522	29,300	778	-4,147
2017	1,513	20,934	19,421	30,052	30,897	844	-18,577
2018	1,513	5,880	4,367	31,582	32,493	911	-3,456
2019	1,513	5,880	4,367	33,113	34,090	977	-3,390
2020	1,513	6,928	5,415	34,643	35,686	1,043	-4,372
2021	1,513	6,928	5,415	35,940	37,042	1,103	-4,313
2022	1,513	6,928	5,415	37,237	38,399	1,162	-4,253
2023	1,513	6,928	5,415	37,237	39,755	2,518	-2,897
2024	1,513	6,928	5,415	37,237	41,111	3,874	-1,541
2025	1,513	6,928	5,415	37,237	42,467	5,230	-185
2026	1,513	6,928	5,415	37,237	43,890	6,654	1,239
2027	1,513	6,928	5,415	37,237	45,314	8,077	2,662
2028	1,513	6,928	5,415	37,237	46,738	9,501	4,086
2029	1,513	6,928	5,415	37,237	48,161	10,925	5,509
2030	1,513	6,928	5,415	37,237	49,585	12,348	6,933
2031	1,513	6,928	5,415	37,237	51,083	13,846	8,431
2032	1,513	6,928	5,415	37,237	52,581	15,344	9,929
2033	1,513	6,928	5,415	37,237	54,079	16,842	11,427
2034	1,513	6,928	5,415	37,237	55,577	18,340	12,925
2035	1,513	6,928	5,415	37,237	57,074	19,838	14,423
2036	1,513	6,928	5,415	37,237	58,647	21,410	15,995
2037	1,513	6,928	5,415	37,237	60,219	22,983	17,567
2038	1,513	6,928	5,415	37,237	61,755	24,519	19,103
2039	1,513	6,928	5,415	37,237	63,291	26,054	20,639
Total	60,500	343,175	282,675	1,167,194	1,417,503	250,309	-32,366

EIRR = -0.88%

Table 4.9.13 Cash Flow of Economic Costs and Benefits [Navoi] (US$ thou.)

Year	Cost			Revenue			Net Economic Benefits
	Base Case	Project Case	Increment Cost	Base Case	Project Case	Increment Revenue	
2000	1,000	2,392	1,392	81	81	0	-1,392
2001	1,000	2,392	1,392	100	100	0	-1,392
2002	1,000	19,790	18,790	119	119	0	-18,790
2003	1,000	19,790	18,790	139	139	0	-18,790
2004	1,000	1,000	0	158	158	0	0
2005	1,000	2,044	1,044	177	177	0	-1,044
2006	1,000	2,044	1,044	200	200	0	-1,044
2007	1,000	2,044	1,044	223	223	0	-1,044
2008	1,000	2,044	1,044	246	246	0	-1,044
2009	1,000	2,044	1,044	269	269	0	-1,044
2010	1,000	4,732	3,732	293	293	0	-3,732
2011	1,000	4,732	3,732	302	302	0	-3,732
2012	1,000	26,236	25,236	312	312	0	-25,236
2013	1,000	26,236	25,236	322	322	0	-25,236
2014	1,000	26,236	25,236	331	331	0	-25,236
2015	1,000	5,437	4,437	341	17,292	16,951	12,514
2016	1,000	6,270	5,270	351	18,073	17,722	12,452
2017	1,000	5,370	4,370	361	18,854	18,493	14,123
2018	1,000	5,370	4,370	371	19,635	19,264	14,894
2019	1,000	5,370	4,370	381	20,416	20,035	15,665
2020	1,000	5,395	4,395	392	21,198	20,806	16,411
2021	1,000	5,395	4,395	401	22,014	21,612	17,217
2022	1,000	5,395	4,395	411	22,307	21,896	17,501
2023	1,000	5,395	4,395	421	23,104	22,683	18,288
2024	1,000	5,395	4,395	431	23,901	23,470	19,075
2025	1,000	5,395	4,395	441	24,698	24,257	19,862
2026	1,000	5,395	4,395	451	25,537	25,086	20,691
2027	1,000	5,395	4,395	461	26,376	25,914	21,520
2028	1,000	5,395	4,395	472	27,215	26,743	22,349
2029	1,000	5,395	4,395	482	28,054	27,572	23,178
2030	1,000	5,395	4,395	492	28,893	28,401	24,006
2031	1,000	5,395	4,395	502	29,781	29,279	24,884
2032	1,000	5,395	4,395	513	30,669	30,156	25,761
2033	1,000	5,395	4,395	523	31,556	31,033	26,638
2034	1,000	5,395	4,395	534	32,444	31,910	27,515
2035	1,000	5,395	4,395	544	33,331	32,787	28,393
2036	1,000	5,395	4,395	555	34,268	33,714	29,319
2037	1,000	5,395	4,395	565	35,205	34,640	30,245
2038	1,000	5,395	4,395	576	36,142	35,567	31,172
2039	1,000	5,395	4,395	586	37,079	36,493	32,098
Total	40,000	279,470	239,470	14,832	671,314	656,482	417,013

EIRR = 8.02%

Table 4.9.14 Cash Flow of Economic Costs and Benefits [Urgench] (US$ thou.)

Year	Cost			Revenue			Net Economic Benefits
	Base Case	Project Case	Increment Cost	Base Case	Project Case	Increment Revenue	
2000	1,723	1,723	0	6,944	6,944	0	0
2001	1,723	1,723	0	7,549	7,549	0	0
2002	1,723	1,723	0	8,155	8,155	0	0
2003	1,723	1,723	0	8,760	8,760	0	0
2004	1,723	1,723	0	9,366	9,366	0	0
2005	1,723	3,746	2,023	9,971	9,971	0	-2,023
2006	1,723	3,746	2,023	10,539	10,539	0	-2,023
2007	1,723	19,925	18,202	11,106	11,106	0	-18,202
2008	1,723	19,925	18,202	11,673	11,673	0	-18,202
2009	1,723	19,925	18,202	12,240	12,240	0	-18,202
2010	1,723	6,725	5,002	12,697	12,806	109	-4,893
2011	1,723	6,725	5,002	13,429	13,660	231	-4,772
2012	1,723	21,511	19,788	14,162	14,514	352	-19,436
2013	1,723	21,511	19,788	14,895	15,369	473	-19,315
2014	1,723	21,511	19,788	15,628	16,223	595	-19,193
2015	1,723	6,789	5,067	16,362	17,078	716	-4,350
2016	1,723	13,359	11,637	17,090	17,912	822	-10,814
2017	1,723	6,263	4,541	17,819	18,748	928	-3,612
2018	1,723	6,263	4,541	18,548	19,583	1,034	-3,506
2019	1,723	6,263	4,541	19,278	20,418	1,140	-3,400
2020	1,723	6,670	4,948	20,009	21,256	1,246	-3,701
2021	1,723	6,670	4,948	20,686	22,026	1,340	-3,607
2022	1,723	6,670	4,948	21,360	22,795	1,435	-3,513
2023	1,723	6,670	4,948	22,035	23,564	1,529	-3,418
2024	1,723	6,670	4,948	22,710	24,333	1,623	-3,324
2025	1,723	6,670	4,948	23,385	25,102	1,718	-3,230
2026	1,723	6,670	4,948	24,094	25,909	1,815	-3,132
2027	1,723	6,670	4,948	24,804	26,716	1,912	-3,035
2028	1,723	6,670	4,948	25,513	27,523	2,010	-2,938
2029	1,723	6,670	4,948	26,222	28,330	2,107	-2,840
2030	1,723	6,670	4,948	26,932	29,136	2,204	-2,743
2031	1,723	6,670	4,948	27,679	29,983	2,304	-2,644
2032	1,723	6,670	4,948	28,427	30,831	2,404	-2,544
2033	1,723	6,670	4,948	29,175	31,678	2,503	-2,445
2034	1,723	6,670	4,948	29,922	32,525	2,603	-2,345
2035	1,723	6,670	4,948	30,670	33,372	2,702	-2,245
2036	1,723	6,670	4,948	31,456	34,158	2,702	-2,245
2037	1,723	6,670	4,948	32,243	34,945	2,702	-2,245
2038	1,723	6,670	4,948	33,029	35,731	2,702	-2,245
2039	1,723	6,670	4,948	33,816	36,518	2,702	-2,245
Total	68,900	326,199	257,299	790,379	839,045	48,667	-208,632

EIRR = invalid

Table 4.9.15 Cash Flow of Economic Costs and Benefits [Nukus] (US$ thou.)

Year	Cost			Revenue			Net Economic Benefits
	Base Case	Project Case	Increment Cost	Base Case	Project Case	Increment Revenue	
2000	550	3,883	3,333	1,037	1,037	0	-3,333
2001	550	3,883	3,333	1,080	1,080	0	-3,333
2002	550	30,550	30,000	1,123	1,123	0	-30,000
2003	550	30,550	30,000	1,166	1,166	0	-30,000
2004	550	30,550	30,000	1,209	1,209	0	-30,000
2005	550	4,955	4,405	1,252	12,296	11,044	6,639
2006	550	4,955	4,405	1,299	13,102	11,803	7,398
2007	550	14,635	14,085	1,347	13,909	12,563	-1,522
2008	550	14,635	14,085	1,394	14,717	13,323	-762
2009	550	4,180	3,630	1,441	15,526	14,085	10,455
2010	550	6,447	5,897	1,489	17,257	15,768	9,871
2011	550	14,388	13,838	1,540	18,160	16,620	2,782
2012	550	5,811	5,261	1,591	19,063	17,472	12,212
2013	550	5,811	5,261	1,591	19,965	18,374	13,113
2014	550	5,811	5,261	1,591	20,867	19,276	14,015
2015	550	7,760	7,210	1,591	21,769	20,178	12,968
2016	550	7,760	7,210	1,591	22,858	21,267	14,057
2017	550	21,448	20,898	1,591	23,948	22,358	1,460
2018	550	21,448	20,898	1,591	25,038	23,448	2,550
2019	550	21,449	20,899	1,591	26,129	24,538	3,639
2020	550	7,962	7,412	1,591	27,220	25,629	18,217
2021	550	7,962	7,412	1,591	28,245	26,654	19,242
2022	550	7,962	7,412	1,591	29,269	27,678	20,266
2023	550	7,962	7,412	1,591	30,293	28,702	21,290
2024	550	7,962	7,412	1,591	31,317	29,726	22,314
2025	550	7,962	7,412	1,591	32,341	30,751	23,338
2026	550	7,962	7,412	1,591	33,419	31,828	24,416
2027	550	7,962	7,412	1,591	34,496	32,906	25,493
2028	550	7,962	7,412	1,591	35,574	33,983	26,571
2029	550	7,962	7,412	1,591	36,651	35,061	27,649
2030	550	7,962	7,412	1,591	37,729	36,138	28,726
2031	550	7,962	7,412	1,591	38,867	37,277	29,864
2032	550	7,962	7,412	1,591	40,005	38,415	31,002
2033	550	7,962	7,412	1,591	41,143	39,553	32,140
2034	550	7,962	7,412	1,591	42,281	40,691	33,278
2035	550	7,962	7,412	1,591	43,419	41,829	34,416
2036	550	7,962	7,412	1,591	44,618	43,028	35,616
2037	550	7,962	7,412	1,591	45,818	44,227	36,815
2038	550	7,962	7,412	1,591	46,958	45,367	37,955
2039	550	7,962	7,412	1,591	48,098	46,508	39,095
Total	22,000	420,155	398,155	59,910	1,037,978	978,069	579,914

EIRR = 9.64%

4.10 Evaluation of Priority Projects

4.10.1 Priority Projects

(1) Air Transportation Facility Development Projects

Through the master planning for long-term development plan of airports and nationwide air navigation system, the following ten (10) projects are selected as the priority projects for modernization of the air transportation development in Uzbekistan.

Project 1 **(PJ-1)**	Development of Existing Tashkent Airport (Class I Airport)
Project 2 **(PJ-2)**	Development of New Tashkent Airport (Class I Airport)
Project 3 **(PJ-3)**	Development of Namangan Airport (Class II Airport)
Project 4 **(PJ-4)**	Development of Fergana Airport (Class II Airport)
Project 5 **(PJ-5)**	Development of Samarkand Airport (Class II Airport)
Project 6 **(PJ-6)**	Development of Termez Airport (Class II Airport)
Project 7 **(PJ-7)**	Development of Bukhara Airport (Class II Airport)
Project 8 **(PJ-8)**	Development of Urgench Airport (Class II Airport)
Project 9 **(PJ-9)**	Development of Nukus Airport (Class II Airport)
Project 10 **(PJ-10)**	Development of Nationwide Air Navigation System

(2) Management Development Projects

In addition to the above projects, through the review on the organization and management procedure of NAC as stated in Chapters 6 and 7, the following four (4) projects related to the institutional and management modernization of NAC are selected.

Project 11 **(PJ-11)**	Program for Establishment of Department of Civil
Project 12 **(PJ-12)**	Improvement Program of Accounting and Management System of Airport Operation
Project 13 **(PJ-13)**	Program for Establishment of Corporate Planning Procedure for Airline Management
Project 14 **(PJ-14)**	Strength Program for Safety Operation in Aviation Sector

4.10.2 Evaluation Criteria of Priority Projects

(1) Evaluation Criteria of Air Transportation Facility Development Projects

Regarding the ten (10) Air Transportation Facility Development, evaluation was made from the viewpoints of the priority in national development plan, urgency of improvement, and efficiency of investment in order to select the high priority airports for subsequent pre-feasibility study. Evaluation was made at 3 grades, namely high (1), medium (2), and low (3). Evaluation criteria consist of the following items:

a) Necessity of Urgent Improvement for Safety and Services

Pre-feasibility study in the next stage will be made regarding the short-term development plan up to 2005. In this context, urgency of improvement was evaluated from the following grades:

Table 4.10.1 Evaluation Criteria : Necessity of Urgent Improvement for Safety and Services

Point	Description
1	Urgent improvement is required due to the deterioration of facilities, and low serviceability to passengers. Furthermore, runway extension is required up to 2005.
2	Runway extension is required during the long-term development
3	Improvement project is already stated.

b) National Development Priorities

National development priorities were evaluated in accordance with the following criteria:

Table 4.10.2 Evaluation Criteria : National Development Priorities

Point	Description
1	Airports which are the principal air transport infrastructure, and importunate for the national economic development.
2	Airports which are importunate for regional economic development.
3	Other airports

c) Importance of Air Transport Network in Uzbekistan

Importance of air transport network in Uzbekistan was evaluated from the viewpoints of air traffic demand and the role of airports in accordance with the following rating:

Table 4.10..3 Evaluation Criteria : National Development Priorities

Point	Description
1	International hub airport in Uzbekistan.
2	Regional core airports having air routes of both international and CIS flights.
3	Other airports

d) Project Cost

To evaluate efficiency of investment costs, unit investment cost per passenger during the long-term development from 2000 to 2020 was adopted.

e) National Economic Cost and Benefit

Based on the results of the preliminary economic analysis, economic worth to Uzbekistan due to implementation of the projects was rated by three grades.

f) Environment Impact by Airport Development

Based on the results of Initial Environmental Evaluation (IEE), the following rating was adopted:

Table 4.10.4 Evaluation Criteria : Environment Impact

Point	Description
1	There is no impact to Natural Environment and Pollution.
2	Some impact is expected
3	Serious impact is expected

(2) Evaluation Criteria of Management Development Projects

Regarding the four (4) Management Development Projects, it is difficult to adopt the same criteria for evaluation of air transportation facility development projects. Therefore, those projects are evaluated through the review of the present situation of management procedures in NAC.

4.10.3 Selection of High Priority Projects

(1) Selection of Air Transportation Facility Development Projects

The results of evaluation are shown in **Table 4.10.5**. Based on the results of evaluation, among ten (10) projects of air transport facility development, the following four (4) airports are selected as the High Priority Airports for the Pre-Feasibility Study, except for Samarkand, Bukhara and Urgench airports, of which the modernization projects are now being implemented, and Fergana airport being controlled by military.

- Tashkent (including New Airport)
- Namangan Airport
- Termez Airport
- Nukus Airport
- Nationwide Air Navigation System

(2) Selection of Management Development Projects

As shown in **Table 4.10.5**, the following projects are selected in order to make recommendation on organization, operation and management related to air transportation development in Uzbekistan.

- Program for Establishment of Department of Civil
- Improvement Program of Accounting and Management System of Airport Operation
- Program for Establishment of Corporate Planning Procedure for Airline Management
- Strength Program for Safety Operation in Aviation Sector

Table 4.10.5 Evaluation of Air Transportatation Development Projects

Evaluation Items	Long-Term Developemnt Projects for Air Transportation in Uzbeksitan												
	PJ-1	PJ-2	PJ-3	PJ-4	PJ-5	PJ-6	PJ-7	PJ-8	PJ-9	PJ-10	PJ-11	PJ-12	PJ-13	PJ-14
	Master Plans for Air Transportation Facilities													
	Metropolitan Airport	Local Airports												
	Exiting Tashkent	New Tashkent	Namangan	Fergana	Samarkand	Termez	Bukhara	Urgench	Nukus	Air Navigation System	Program for Establishment of Department of Civil Aviation	Improvement Program of Airport Management	Training Program for Airline Management	Streagthening Program of Safety Operation
Outline of Projects	Improvement of Existing Facilitates	New Airport	New Runway	New Runway	Improvement of Existing Facilities	Improvement of Existing Facilities	Improvement of Existing Facilities	Improvement of Existing Facilities	Improvement of Existing Facilities	Modernization of Nationwide Air Navigation Facilities	Establishment of New Department of Civil Aviation	Improvement of Airport Management	Improvement of Corporate Planning Improvement	Improvement of Training Program for Pilot and Mechanics
A Urgency of Improvement	1	2	1	1	3	2	3	3	1	1	1	1	1	1
B National Development Priority	1	1	3	2	2	2	2	2	3	1	1	1	1	1
D Importance of Air Transport Network	1	1	2	2	2	2	2	2	2	1	3	1	1	1
E Air Transport Demand	1	1	3	2	2	3	3	3	3	-	-	-	-	-
(Passenger demand in 2020: thousand)	(4,470)	(4,470)	(700)	(1,220)	(950)	(630)	(730)	(870)	(570)					
F Project Cost	1	2	3	2	1	3	2	1	3	-	-	-	-	-
(Cost/Passenger)	(US$5)	(US$15)	(US$25)	(US$11)	(US$7)	(US$20)	(US$13)	(US$10)	(US$22)					
G National Economic Benefit	1	2	2	2	2	2	3	3	2	-	-	-	-	-
(EIRR)	(20.50%)	(10.01%)	(5.58%)	(11.01%)	(7.95%)	(5.66%)	(Invalid)	(Invalid)	(9.64%)					
H Environmental Impact	3	2	2	2	2	1	2	2	2	-	-	-	-	-
I **Total Point**	**9**	**11**	**16**	**13**	**14**	**15**	**17**	**16**	**16**					
J Overall Evaluation	High priority project due to international hub airport	High priority project due to international hub airport	High priority project due to regional core airport	A high priority airport, but under military control	Not a high priority project due to the ongoing project	High priority project due to regional core airport	Not a high priority project due to the ongoing project	Not a high priority project due to the ongoing project	High priority project due to regional core airport	High priority project due to superannuation of the existing facilities	High priority project in order to modernize the present organization	High priority project in order to improve the present account system and management procedures.	High priority project in order to improve the management procedures for airline business.	High priority project in order to strengthen the safety operation.
(Order of Priority)	1	2	5	9	6	3	8	7	4					
L **Selection of High Priority Projects**	●	●	●			●			●	●	●	●	●	●

CHAPTER 5

ENVIRONMENTAL STUDY

CHAPTER 5 ENVIRONMENTAL STUDY

5.1 Laws and Standards

5.1.1 The Nature Protection Law

"The Nature Protection Law " is the fundamental law of environmental management in Uzbekistan. "The Nature Protection Law " is composed of eleven sections as shown in **Fig. 5.1.1**.

Present law establishes juridical, economic and organizational bases of nature environmental conditions, rational use of natural resources. The aim of the law is to provide balanced harmonic development of relations between a human and nature, protection of ecological systems, natural complexes and separate objects, to guarantee rights of citizens on a favorable environment.

In order to solve ecological problems, the "Complex Scientific and Technical Program for Environment Protection in the Republic of Uzbekistan" has been developed. In 1986-1990, a number of republican programs and laws on environmental protection have been adopted. The Republican State Committee on environment protection was set up; all sources of harmful effluents have been registered.

The Environmental Impact Assessment System is stipulated in Section 6 "Ecological Examinations" of The Nature Protection Law.

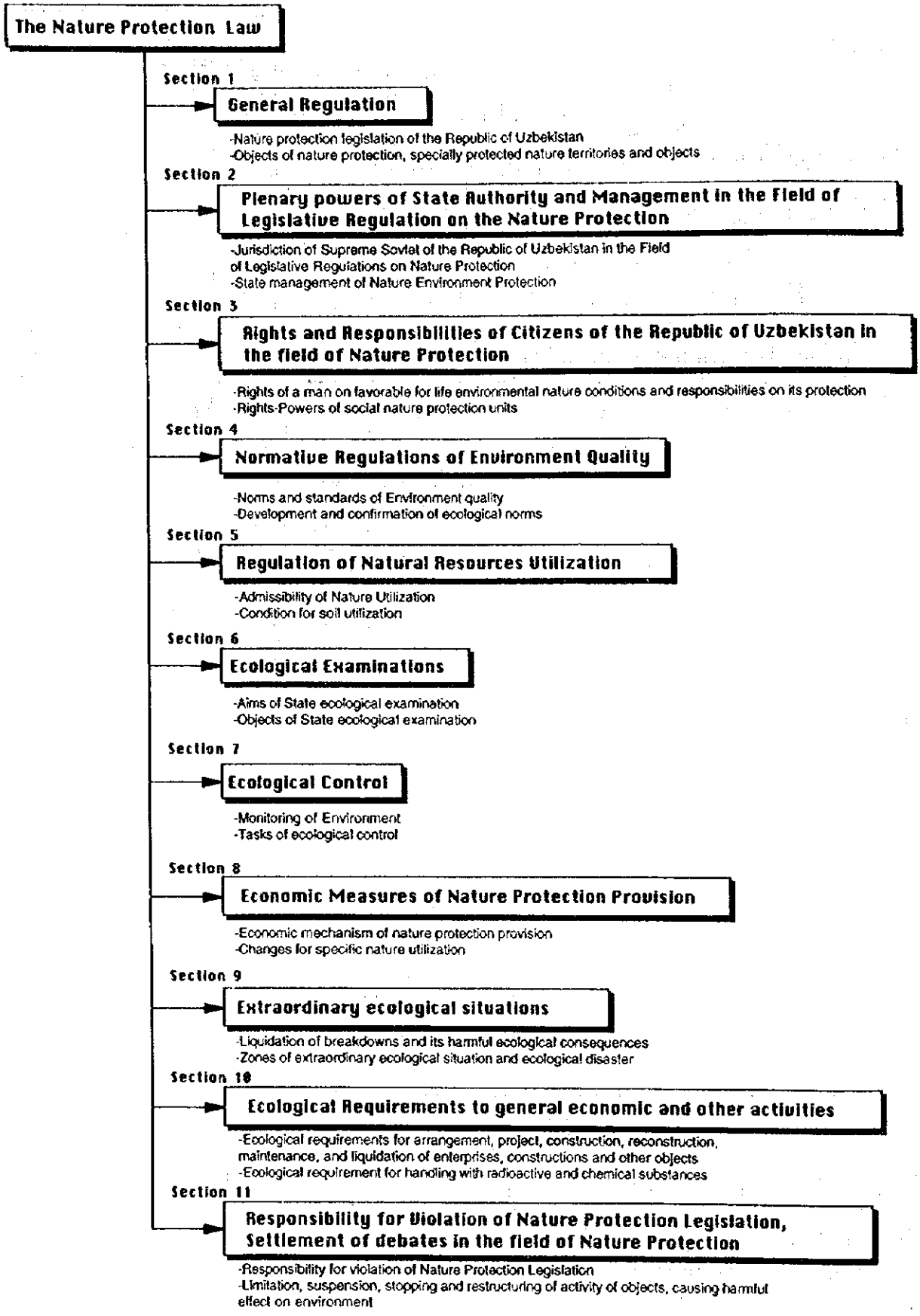


Fig. 5.1.1 The Nature Protection Law of Uzbekistan

5.1.2 Standards

Aircraft noise and air quality, water quality standards are shown through form **Table 5.1.1** to **Table 5.1.3**.

Table 5.1.1 Aircraft Noise Standards

Time	Equivalent continuous A-weighted sound pressure level(LAeq dB)	Maximum noise A-weighted sound pressure level (LAmax dB)
Daytime (07:00-23:00)	65	85
Nighttime (23:00-07:00)	55	75

Note: The noise levels in daytime approved at Tashkent Airport is between 85dB(A) and 95dB(A) at ten times per day.

Source: Published in State Standard of USSR 22283-88, Aviation noise, issued in 1/1/1993

Table 5.1.2 Ambient Air Quality Standards

Parameter	One time measurement (mg/m^3)	Daily average (mg/m^3)
NO_2	0.085	0.04
SO_2	0.5	0.05
CO	5.0	3.0
Dust	0.5	0.15

Note: Only main parameters are shown

Source: Published in 1986

Table 5.1.3 Sanitary Regulations and Norms of Surface Waters Protection from Pollution (Hygienic requirement to composition and properties of water used for potable-household and recreation at water)

Parameter	General use and Potable water supply, for water-supply of food industry-enterprise	Recreation at use
Hydrogen ion exponent(pH)	6.5 - 8.5	
Dissolved oxygen (DO)	Should not be less than 4 mg/ml at and period of a year in sample taken before 12 o'clock at daytime.	
Biological oxygen demand(BOD)	Should not exceed at 20 °C: $3.0mgO_2/l$	$6.0mgO_2/l$
Chemical oxygen demand(COD)	Should not exceed:	
	$15.0mgO_2/l$	$30.0mgO_2/l$

Note: Only main parameters are shown

Source: Published in Ministry of health of the USSR, Moscow-1988

5.2 Issues at Present

5.2.1 Meteorology

(1) The Central Asia

The Central Asia climate is characterized by the high level of solar radiation, summer heat impacts and poor annual precipitation **(Figs. 5.2.1 and 5.2.2)**.

During the past 10 to 15 years, the rising temperature in this region are striking. The warming is caused by the global temperature accompanied by the increase of CO2 concentration and other greenhouse effects and by local human factors. Precipitation have slightly increased in the western region.

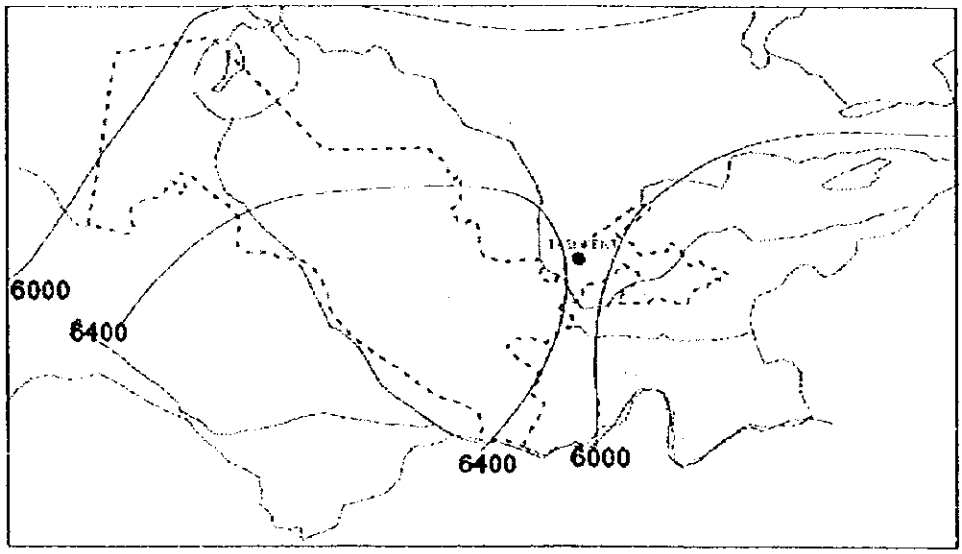


Fig. 5.2.1 Total Amount of Solar Radiation (mj/m^2) in the Central Asia

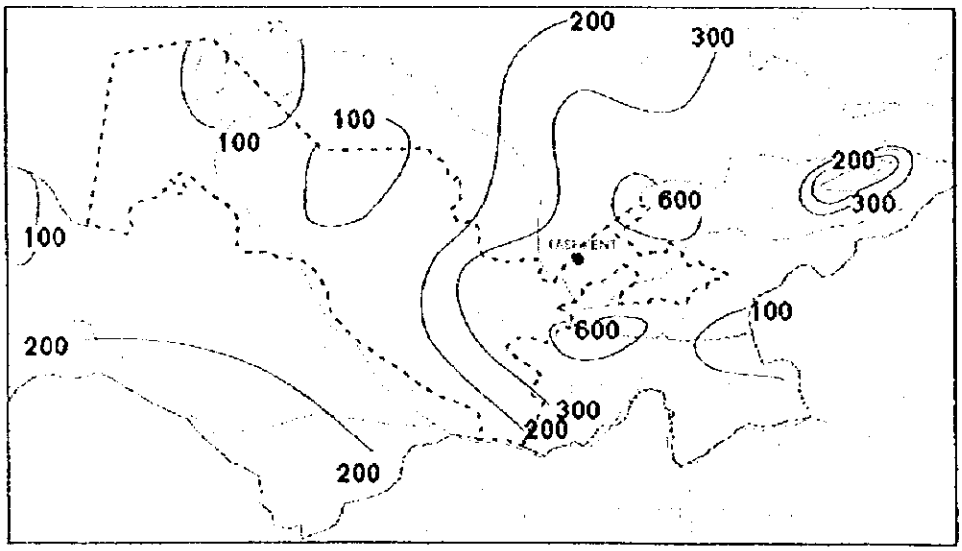


Fig. 5.2.2 Precipitation per Year(mm) in the Central Asia

(2) Uzbekistan

Uzbekistan has a warm, sharply continental and very arid clime the same as the other Central Asia republics.

The temperature of the top soil which is almost devoid of vegetation in the plains, frequently rises to 60 oC and temperature of the air to 40 - 45 oC at noontime in the summer months (from the end of May to October). There is considerable difference between summer and winter temperature and sudden sharp changes in the weather. The unstable, fairly cold winter abruptly gives way to a warm, rainy spring which in turn is replaced by dry summer.

(3) Tashkent Airport

The Tashkent airport is under the influence of two major clime, severe continentally and dryness. It is unstable and wet weather that starts in December and ends in March. The date of snow-cover appearance is marked about from 15 December to 20 February.

The climatological data were measured at 430m height of sea level in Tashkent airport (41o15' 26" N, 69o16' 54" E). The main climatological characteristics can be summarized as follows:

a) Wind speed and direction

The monthly average wind speed is in the range of 1.5 to 2.2 m/sec, and the prevailing wind throughout the year comes from generally north-west. The wind monthly average wind speed is shown in **Fig. 5.2.3**.

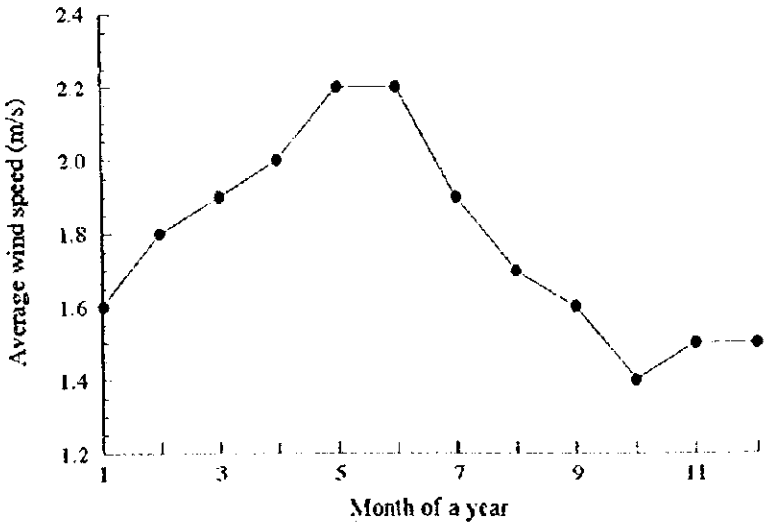


Fig. 5.2.3 The Monthly Average Wind Speed of the Tashkent Airport

b) Temperature

The monthly average, maximum and minimum temperature is in the range of 0.8oC to 27.0oC, 6.4 oC to 35.7 oC and -3.6 oC to 19.4 oC, respectively. The minimum temperature is recorded in January, and maximum temperature reaches to 35.7oC in July. The diurnal fluctuation is the largest in July , the extremes of temperature is amounted about 16oC

The monthly changes of temperature is shown in **Fig.5.2.4.**

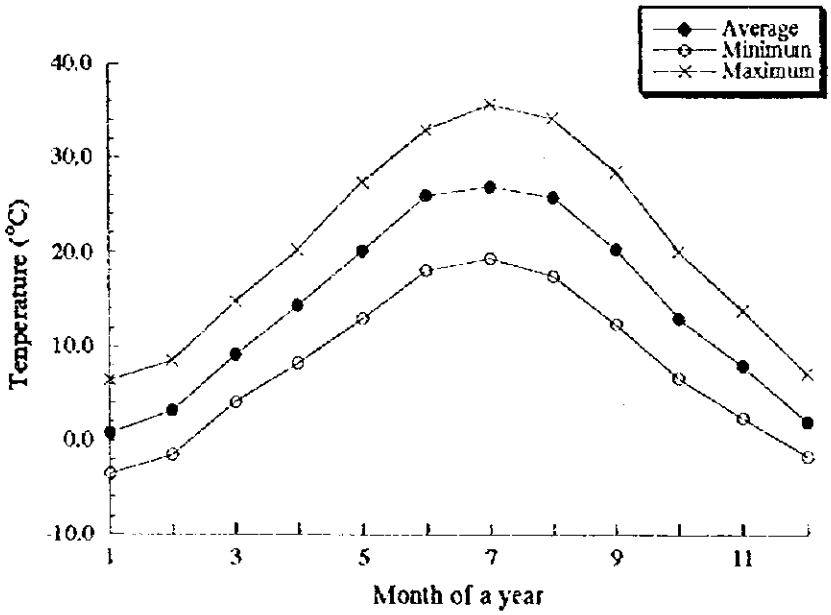


Fig. 5.2.4 Monthly Temperature at the Tashkent Airport

5.2.2 Hydrogeology around Tashkent Airport

According to the results of the investigation on conditions of hydrogeology around Tashkent airport conducted by NAC in 1996, geomorphologically, territory of Tashkent airport is situated on the right side second terrace of the Chrichic river valley. A surface of the terrace represents a flat with a slight slope towards south-west.

In geological structure of the airport territory, there are quartered deposits. They are represented by pebbles with contents of boulders, interlayer of conglomerates on sand lime-like cement, covered in some places of surface by weak-power fine soil.

Ground water results from infiltration of irrigation system and irrigated field, and also, on the account of underground inflow of ground water from upper part of the valley. Groundwater in pebble layer up to depth of 70m forms united unpressured water-carrying horizon. Levels of underground waters within the bounds of second terrace fluctuates during a yeas from 2 meters up

to 4.5 meters above the ground surface.

Water-carrying horizon has a good water sufficiency and high filtration properties. On the base of analyses of hydrogeological conditions of territory of Tashkent airport, it was identified that alluvial deposits in section and in plan was formed by one-side inflow of underground waters from north-east part of Tashkent.

5.2.3 Air Quality and Pollutant

(1) Air Quality around Tashkent Airport

The air quality at Tashkent Airport was monitored once by NAC in 1994 in respect to four air pollutants: inorganic dust, nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), phenol. The monitoring result is shown in **Table 5.2.1**. Regulations for the air quality standards in Uzbekistan defines the major parameters criteria pollutants such as inorganic dust, nitrogen oxides, sulfur dioxide and carbon monoxide. According to the results monitoring, which was only one time measurement, concentration parameters of air pollutants exceed the standards, except SO_2 and phenol concentration.

Table 5.2.1 Air Quality Monitoring Data at Tashkent Airport

Items	Observed Data	Standards
Inorganic dust	0.9 mg/m^3	
Nitrogen dioxide (NO_2)	0.17 mg/m^3	0.085 mg/m^3
Sulfur dioxide (SO_2)	0.05 mg/m^3	0.5 mg/m^3
Carbon monoxide (CO)	8 mg/m^3	5 mg/m^3
Phenol	0.018 mg/m^3	0.5 mg/m^3

(2) Air Pollutant

A total amount of air pollutants discharged from emission sources at the airports area into the atmosphere were estimated by NAC's survey as shown from **Fig. 5.2.5 to Fig. 5.2.7.**

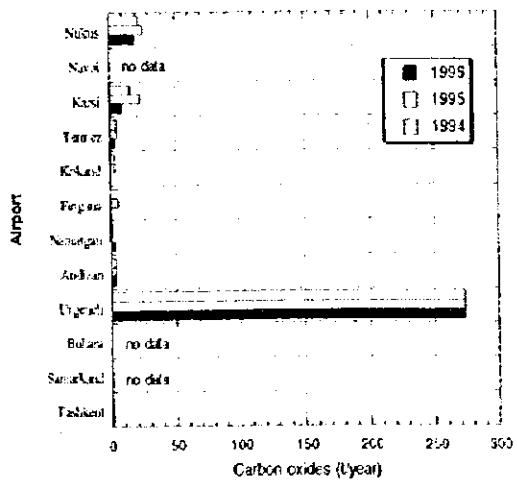


Fig. 5.2.5 Carbon Oxides

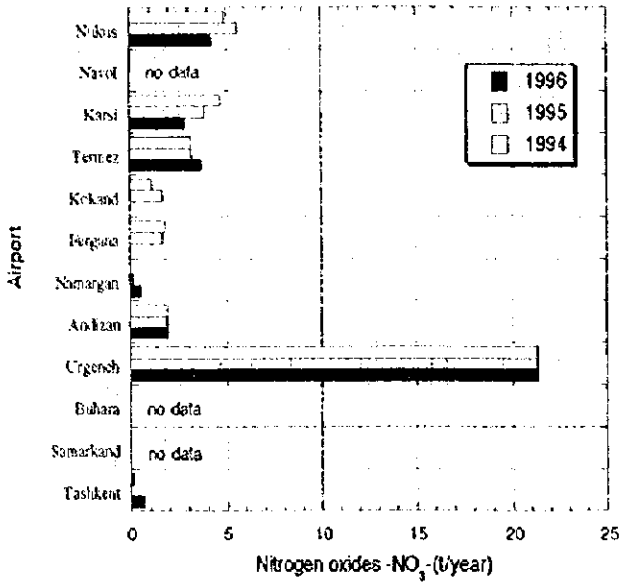


Fig. 5.2.6 Nitrogen Oxides

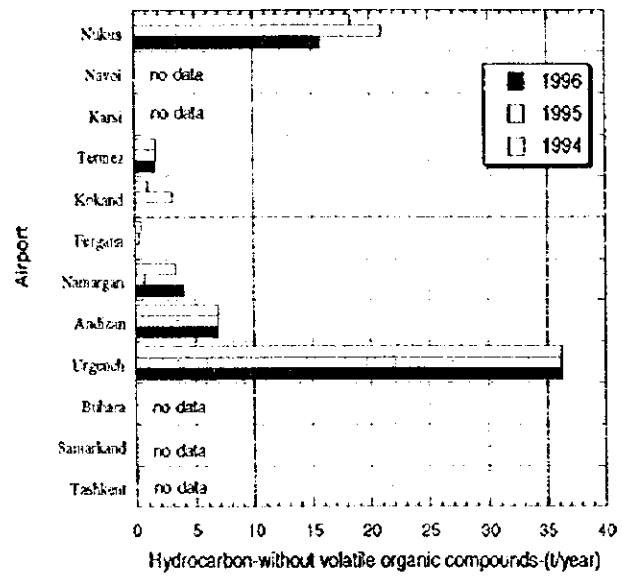


Fig. 5.2.7 Hydrocarbon

5.2.4 Aircraft Noise

(1) Tashkent Airport Area

Aircraft noise and ambient noise levels were measured at six points of sensitive receptors. The Following noise levels were calculated to compare with the standards.

- Aircraft noise: Maximum A-weighted sound pressure level (LAmax) and Weighted equivalent continuous perceived noise level (WECPNL)
- -Ambient noise: Equivalent continuous A-weighted sound pressure level (LAeq)

The results are shown in **Table 5.2.2** and **Table 5.2.3**.

The LAeq measured at the six stations were at the range between 54.3 and 78.1 dB for daytime, and between 49.8 to 77.8 dB for midnight. The maximum LAeq level was recorded at N3 station (the eastern side of the runway under take-off flight course), was 78.1 dB during the daytime, and 77.8 dB during midnight respectively.

The LAmax measured at the six stations were at the range between 75.6 and 106.4 dB for daytime, and between 65.1 to 106.4 dB for midnight. The maximum LAmax level was recorded at N3 station (the eastern side of the runway under take-off flight course), was 106.4 dB both during the daytime and midnight.

(2) New Tashkent Airport Area

Ambient noise-levels around New Tashkent airport area were measured at three sites.

Noise samples were recorded three times at 5 seconds intervals at each station. The results are shown in **Table 5.2.4**. The recorded ambient noise levels are presented as LAeq and LAmax.

Table 5.2.2 Measured Ambient Noise Levels in Tashkent Airport Area

LOCATION	DATE	LAeq(dB)		LAmax(dB)	
		Daytime(07:00-23:00)	Nighttime(23:00-07:00)	Daytime(07:00-23:00)	Nighttime(23:00-07:00)
N1	1997/5/6	68.8	68.6	96.7	92.0
	1997/5/7	69.0	66.0	94.1	89.8
	1997/5/8	68.8	63.7	97.1	92.7
N2	1997/5/9	63.9	62.7	91.8	87.0
	1997/5/10	63.2	61.0	88.6	88.8
	1997/5/11	60.2	61.0	90.6	85.9
N3	1997/5/2	76.0	61.1	102.8	85.1
	1997/5/3	78.1	77.8	106.4	106.4
	1997/5/4	75.6	72.9	102.0	99.2
N4	1997/5/6	55.8	54.8	81.9	77.8
	1997/5/7	59.4	54.9	88.7	79.9
	1997/5/8	56.3	54.5	78.2	74.5
N5	1997/5/6	71.5	72.8	96.1	98.6
	1997/5/7	71.5	70.5	96.2	94.8
	1997/5/8	65.9	68.8	95.8	95.9
N6	1997/5/2	55.0	49.8	84.8	72.2
	1997/5/3	54.3	50.5	76.1	73.6
	1997/5/4	54.8	50.7	75.6	65.1

Table 5.2.3 Measured Aircraft Noise Levels in Tashkent Airport Area

LOCATION	DATE	WECPNL1	WECPNL3
N1	1997/5/27	77.0	
	1997/5/28	79.8	77.7
	1997/5/29	74.7	
N2	1997/5/27	73.4	
	1997/5/28	75.8	74.1
	1997/5/29	72.4	
N3	1997/5/24	89.4	
	1997/5/25	86.2	87.4
	1997/5/26	85.5	
N4	1997/5/24	72.9	
	1997/5/25	72.5	72.4
	1997/5/26	71.8	
N5	1997/5/24	82.1	
	1997/5/25	83.4	82.4
	1997/5/26	81.5	
N6	1997/5/27	67.9	
	1997/5/28	70.7	68.8
	1997/5/29	66.8	

N1: The western side of runway, located under landing course

N2: The southwestern side of runway, located under landing course

N3: The eastern side of runway, located under take-off course

N4: The northeastern side of runway

N5: The southeastern side of runway, located under take-off course

N6: The northwestern side of runway

Table 5.2.4 Measured Ambient Noise Levels in New Tashkent Airport Area

LOCATION	TIME	LAeq dB(A)	LAmax DB(A)	Weather	Temperature (°C)	Major Noise Source
A	12:15-12:20	42.0	59.9	Fine	31	Car
	12:20-12:25	36.8	56.0			Birds
	12:25-12:30	34.5	56.8			
B	12:35-12:40	35.4	55.3	Fine	32	Wind through foliage
	12:45-12:50	33.1	48.9			Running Water
	12:52-12:57	37.8	56.8	Fine	35	
C	13:30-13:35	40.3	57.8			Wind through foliage
	13:35-13:40	40.3	57.9			Running Water
	13:45-13:50	41.5	66.3			

A: Near village and road in east side of New Tashkent airport runway
B: Near the farm and the irrigation channel in east side of New Tashkent airport runway
C: Near the farm and the irrigation channel in north side of New Tashkent airport runway

5.3 Initial Environmental Evaluation (IEE)

5.3.1 Basic Concept and Summary

In order to maintain sustainable development, it is of great important to take environment matters into full consideration in implementation of development projects. The purpose of Initial Environmental Evaluation (IEE) is to examine the environmental impact which might be caused by the airport development, and to select items for Environmental Impact Analysis, which is to be carried out in the 2nd field survey in Uzbekistan for Feasibility Study on selected high priority projects.

In accordance with the Initial Environmental Evaluation Guideline for Environmental Impact Assessment of JICA, the results of scoping of each environmental items in are summarized as shown in **Table 5.3.1**.

5.3.2 Environmental Condition of the Priority Airport Sites

The summary results of scoping each Environmental Condition of the 12 airports and new Tashkent airport site, except for Tashkent Airport, Bukhara Airport, Samarkand Airport, New Tashkent Airport, were examined. The results are shown through **Table 5.3.2** to **Table 5.3.14**.

5.3.3 Screening

Screening is a process to identify whether or not a project requires environmental impact assessment and the level of assessment. This process was performed by using a check list method. The results are shown through **Table 5.3.15** to **Table 5.3.27**.

5.3.4 Scoping

Scoping is a process to select the major environmental items which may be caused impact surrounding area of the airport by the implementation of the project. This process was performed by using a check list method. The results are shown through **Table 5.3.28** to **Table 5.4.40**.

Table 5.3.1 Summary of Scoping of Priority Airports

	Environmental Items	New Tashkent	Tashkent	Andizhan	Namangan	Fergana	Kokand	Samarkand	Termez	Karshi	Bukhara	Navoi	Urgench	Nukus
[Social Environment]														
1	Resettlement	B	D	D	D	D	D	D	D	D	D	D	D	D
2	Economic Activities	B	D	D	D	D	D	D	D	D	D	D	D	D
3	Traffic & Public Facilities	B	C	C	C	C	D	D	D	C	D	D	C	C
4	Split of Communities	B	D	D	D	D	D	D	D	D	D	D	D	D
5	Cultural Property	C	D	D	D	D	D	D	D	D	D	D	D	D
6	Water Right & Right of Comm.	C	D	D	D	D	D	D	D	D	D	D	D	D
7	Public Health Condition	B	D	D	D	D	D	D	D	D	D	D	D	D
8	Waste	B	D	D	D	D	D	D	D	D	D	D	D	D
9	Hazards (Risk)	B	B	B	B	B	D	B	D	D	C	D	C	D
[Natural Environment]														
10	Topography & Geology	A	D	D	D	D	D	D	D	D	D	D	D	D
11	Soil Erosion	A	D	D	D	D	D	D	D	D	D	D	D	D
12	Ground Water	A	D	D	D	D	D	D	D	D	D	D	D	D
13	Hydrological Situation	A	D	D	D	D	D	D	D	D	D	D	D	D
14	Coastal Zone	D	D	D	D	D	D	D	D	D	D	D	D	D
15	Fauna and Flora	C	D	D	D	D	D	D	D	D	D	D	D	D
16	Meteorology	C	D	D	D	D	D	D	D	D	D	D	D	D
17	Landscape	A	D	D	D	D	D	D	D	D	D	D	D	D
[Pollution]														
18	Air Pollution	C	C	C	C	C	D	D	D	C	D	D	C	C
19	Water Pollution	C	D	D	D	D	C	C	C	C	C	C	D	D
20	Soil Contamination	C	D	D	D	D	C	C	C	C	C	C	D	D
21	Noise and Vibration	C	B	B	B	B	D	D	D	C	D	D	B	B
22	Land Subsidence	C	D	D	D	D	D	D	D	D	D	D	D	D
23	Offensive Odor	C	D	D	D	D	D	D	D	D	D	D	D	D

Note : Evaluation Category

A: Serious impact is expected

B: Some impact is expected.

C: Extent of impact is unknown. (Examination is needed. Impacts may become clear as study progress)

D: No impact is expected. IEE/EIA is not necessary.

Table 5.3.2 Environmental Conditions (New Tashkent)

SOCIAL ENVIRONMENT	
Item	Condition
Inhabitant (residents, indigenous people, their view on the project, etc.)	There are villages in the vicinity of the project site.
Land Use (urban area, farmland, historic spot, scenic spot, hospital, etc.)	The project site is an agriculture area at present.
Economy / Transport (Commerce, agriculture, industry, bus terminal, etc.)	Site is located between the state road M-39 and railway.
NATURAL ENVIRONMENT	
Item	Condition
Topography / Geology (steep slope, soft ground, wet land, faults, etc.)	New site is located about 40 km from Tashkent city center. Altitude of the site is approx. 330 m-360 m, having gradual slope from north to southeast.
Fauna and Flora and Their habitats (rare species, mangroves, coral reefs, etc.)	Unknown
POLLUTION	
Item	Condition
Complaints (pollution of the uppermost concern, etc.)	Unknown
Counter Measures (institutional measures, compensation, etc.)	Unknown
Others (special mention items, etc.)	Unknown

Table 5.3.3 Environmental Conditions (Tashkent)

SOCIAL ENVIRONMENT	
Item	Condition
Inhabitant (residents, indigenous people, their view on the project, etc.)	Airport is located in urbanized area.
Land Use (urban area, farmland, historic spot, scenic spot, hospital, etc.)	Urbanized area.
Economy / Transport (Commerce, agriculture, industry, bus terminal, etc.)	There are several roads including airport access road, and railway.
NATURAL ENVIRONMENT	
Item	Condition
Topography / Geology (steep slope, soft ground, wet land, faults, etc.)	The land in the vicinity of the airport is relatively flat.
Fauna and Flora and Their habitats (rare species, mangroves, coral reefs, etc.)	There are no habitats for rare animals and plants in the vicinity of the airport.
POLLUTION	
Item	Condition
Complaints (pollution of the uppermost concern, etc.)	No complaints have been received so far about the pollution of the airport.
Counter Measures (institutional measures, compensation, etc.)	None
Others (special mention items, etc.)	None

Table 5.3.4 Environmental Conditions (Andizhan)

SOCIAL ENVIRONMENT	
Item	Condition
Inhabitant (residents, indigenous people, their view on the project, etc.)	There are residents about 1 km away from the north-west of runway.
Land Use (urban area, farmland, historic spot, scenic spot, hospital, etc.)	An urban area is located close to the airport, although the land in the vicinity of it is grassland.
Economy / Transport (Commerce, agriculture, industry, bus terminal, etc.)	The staple products of Andizhan City are the automobile industry with foreign country finance, etc. From city central to the airport is assessable by general road.
NATURAL ENVIRONMENT	
Item	Condition
Topography / Geology (steep slope, soft ground, wet land, faults, etc.)	The land in the vicinity of the airport is relatively flat.
Fauna and Flora and Their habitats (rare species, mangroves, coral reefs, etc.)	There are no habitats for rare animals and plants in the vicinity of the airport.
POLLUTION	
Item	Condition
Complaints (pollution of the uppermost concern, etc.)	No complaints have been received so far about the pollution of the airport, although there are residents near the north-east part of the airport.
Counter Measures (institutional measures, compensation, etc.)	None
Others (special mention items, etc.)	None

Table 5.3.5 Environmental Conditions (Namangan)

SOCIAL ENVIRONMENT	
Item	Condition
Inhabitant (residents, indigenous people, their view on the project, etc.)	There is agricultural land in the vicinity of the airport, except some residents are about 1-2 km away from the west of runway.
Land Use (urban area, farmland, historic spot, scenic spot, hospital, etc.)	An urban area is close to the airport , although the land in the vicinity of it is a grassland.
Economy / Transport (Commerce, agriculture, industry, bus terminal, etc.)	Namangan City is the third largest city in Uzbekistan. The staple products are industry, agriculture, commerce. From city central to the airport is accessible by general road.
NATURAL ENVIRONMENT	
Item	Condition
Topography / Geology (steep slope, soft ground, wet land, faults, etc.)	The land in the vicinity of the airport is relatively flat.
Fauna and Flora and Their habitats (rare species, mangroves, coral reefs, etc.)	There are no habitats for rare animals and plants in the vicinity of the airport.
POLLUTION	
Item	Condition
Complaints (pollution of the uppermost concern, etc.)	No complaints have been received so far about the pollution of the airport.
Counter Measures (institutional measures, compensation, etc.)	None
Others (special mention items, etc.)	None

Table 5.3.6 Environmental Conditions (Fergana)

SOCIAL ENVIRONMENT	
Item	Condition
Inhabitant (residents, indigenous people, their view on the project, etc.)	There are residents in back of it's terminal and 1 km away from the north of runway. The other area in the vicinity of the airport is vacant land.
Land Use (urban area, farmland, historic spot, scenic spot, hospital, etc.)	There are residents to the north and west of the airport. The other area around the airport are grassland.
Economy / Transport (Commerce, agriculture, industry, bus terminal, etc.)	The staple products of Fergana City are tourism, the petrochemical industry, the chemical industry and light industry , etc. Tourism is all the rage. From the city center to the airport is accessable by the general road. There is little traffic on the road.
NATURAL ENVIRONMENT	
Item	Condition
Topography / Geology (steep slope, soft ground, wet land, faults, etc.)	The land in the vicinity of the airport is relatively flat. The soil consists of stiff sand.
Fauna and Flora and Their habitats (rare species, mangroves, coral reefs, etc.)	There are no habitats for rare animals and plants in the vicinity of the airport.
POLLUTION	
Item	Condition
Complaints (pollution of the uppermost concern, etc.)	No complaints have been received so far about the pollution of the airport, although there is residents at the extent area of the north approach course.
Counter Measures (institutional measures, compensation, etc.)	None
Others (special mention items, etc.)	None

Table 5.3.7 Environmental Conditions (Kokand)

SOCIAL ENVIRONMENT	
Item	Condition
Inhabitant (residents, indigenous people, their view on the project, etc.)	There is a vacant land in the vicinity of the airport.
Land Use (urban area, farmland, historic spot, scenic spot, hospital, etc.)	The land in the vicinity of the airport is grassland or wasteland.
Economy / Transport (Commerce, agriculture, industry, bus terminal, etc.)	The staple products of Kokand City are the electric machine industry, the car garage, the textile industry and the parts manufacturing industry, etc. From the city center to the airport is accessable by general roads. There is little traffic on the road.
NATURAL ENVIRONMENT	
Item	Condition
Topography / Geology (steep slope, soft ground, wet land, faults, etc.)	The land in the vicinity of the airport is relatively flat. The soil consists of stiff sand.
Fauna and Flora and Their habitats (rare species, mangroves, coral reefs, etc.)	There are no habitats for rare animals and plants in the vicinity of the airport.
POLLUTION	
Item	Condition
Complaints (pollution of the uppermost concern, etc.)	No complaints have been received so far about the pollution of the airport as there is a vacant land around it.
Counter Measures (institutional measures, compensation, etc.)	None
Others (special mention items, etc.)	None

Table 5.3.8 Environmental Conditions (Samarkand)

SOCIAL ENVIRONMENT	
Item	Condition
Inhabitant (residents, indigenous people, their view on the project, etc.)	Residence area is expanded around the airport.
Land Use (urban area, farmland, historic spot, scenic spot, hospital, etc.)	The land in the vicinity of the airport is urban area and a few cultivated land.
Economy / Transport (Commerce, agriculture, industry, bus terminal, etc.)	From the city center to the airport is accessible by general road. There is little traffic on the road.
NATURAL ENVIRONMENT	
Item	Condition
Topography / Geology (steep slope, soft ground, wet land, faults, etc.)	The land in the vicinity of the airport is relatively flat. The soil is mainly sand gravel.
Fauna and Flora and Their habitats (rare species, mangroves, coral reefs, etc.)	There are no habitats for rare animals and plants in the vicinity of the airport.
POLLUTION	
Item	Condition
Complaints (pollution of the uppermost concern, etc.)	No complaints have been received so far about the pollution of the airport as there is vacant land around it.
Counter Measures (institutional measures, compensation, etc.)	None
Others (special mention items, etc.)	None

Table 5.3.9 Environmental Conditions (Termez)

SOCIAL ENVIRONMENT	
Item	Condition
Inhabitant (residents, indigenous people, their view on the project, etc.)	There is vacant land in the vicinity of the airport , especially the approach and take-off course of aircraft.
Land Use (urban area, farmland, historic spot, scenic spot, hospital, etc.)	The land in the vicinity of the airport is grassland.
Economy / Transport (Commerce, agriculture, industry, bus terminal, etc.)	From the city center to the airport is accessable by general road. There is little traffic on the road.
NATURAL ENVIRONMENT	
Item	Condition
Topography / Geology (steep slope, soft ground, wet land, faults, etc.)	The land in the vicinity of the airport is relatively flat. The soil consists of silt.
Fauna and Flora and Their habitats (rare species, mangroves, coral reefs, etc.)	There are no habitats for rare animals and plants in the vicinity of the airport.
POLLUTION	
Item	Condition
Complaints (pollution of the uppermost concern, etc.)	No complaints have been received so far about the pollution of the airport as there is vacant land around it.
Counter Measures (institutional measures, compensation, etc.)	None
Others (special mention items, etc.)	None

Table 5.3.10 Environmental Conditions (Karshi)

SOCIAL ENVIRONMENT	
Item	Condition
Inhabitant (residents, indigenous people, their view on the project, etc.)	There is vacant land in the vicinity of the airport, except around the terminal.
Land Use (urban area, farmland, historic spot, scenic spot, hospital, etc.)	The land in the vicinity of the airport is grassland except around the terminal.
Economy / Transport (Commerce, agriculture, industry, bus terminal, etc.)	Karshi City produces the mining of natural gas and oil, and paper manufacture.
NATURAL ENVIRONMENT	
Item	Condition
Topography / Geology (steep slope, soft ground, wet land, faults, etc.)	The land in the vicinity of the airport is relatively flat. The soil consists of silt.
Fauna and Flora and Their habitats (rare species, mangroves, coral reefs, etc.)	There are no habitats for rare animals and plants in the vicinity of the airport.
POLLUTION	
Item	Condition
Complaints (pollution of the uppermost concern, etc.)	No complaints have been received so far about the pollution of the airport as there is a vacant land around it.
Counter Measures (institutional measures, compensation, etc.)	None
Others (special mention items, etc.)	None

Table 5.3.11 Environmental Conditions (Bukhara)

SOCIAL ENVIRONMENT	
Item	Condition
Inhabitant (residents, indigenous people, their view on the project, etc.)	There are residents in the vicinity of the airport.
Land Use (urban area, farmland, historic spot, scenic spot, hospital, etc.)	The land in the vicinity of the airport is cultivated land.
Economy / Transport (Commerce, agriculture, industry, bus terminal, etc.)	Bukhara City produces the mining of natural gas and the chemical industry (paper manufacture etc.).
NATURAL ENVIRONMENT	
Item	Condition
Topography / Geology (steep slope, soft ground, wet land, faults, etc.)	The land in the vicinity of the airport is relatively flat.
Fauna and Flora and Their habitats (rare species, mangroves, coral reefs, etc.)	There are no habitats for rare animals and plants in the vicinity of the airport.
POLLUTION	
Item	Condition
Complaints (pollution of the uppermost concern, etc.)	No complaints have been received so far about the pollution of the airport as there is no residents around it.
Counter Measures (institutional measures, compensation, etc.)	None
Others (special mention items, etc.)	None

Table 5.3.12 Environmental Conditions (Navoi)

SOCIAL ENVIRONMENT	
Item	Condition
Inhabitant (residents, indigenous people, their view on the project, etc.)	There are no residents in the vicinity of the airport. Navoi City is fifteen miles away from airport.
Land Use (urban area, farmland, historic spot, scenic spot, hospital, etc.)	The land in the vicinity of the airport is grassland.
Economy / Transport (Commerce, agriculture, industry, bus terminal, etc.)	Navoi City produces the mining of natural gas and the chemical industry (paper manufacture etc.). One access road to the airport.
NATURAL ENVIRONMENT	
Item	Condition
Topography / Geology (steep slope, soft ground, wet land, faults, etc.)	The land in the vicinity of the airport is relatively flat.
Fauna and Flora and Their habitats (rare species, mangroves, coral reefs, etc.)	There are no habitats for rare animals and plants in the vicinity of the airport.
POLLUTION	
Item	Condition
Complaints (pollution of the uppermost concern, etc.)	No complaints have been received so far about the pollution of the airport as there is no residents around it.
Counter Measures (institutional measures, compensation, etc.)	None
Others (special mention items, etc.)	None

Table 5.3.13 Environmental Conditions (Urgench)

SOCIAL ENVIRONMENT	
Item	Condition
Inhabitant (residents, indigenous people, their view on the project, etc.)	There are no residents in the vicinity of the airport.
Land Use (urban area, farmland, historic spot, scenic spot, hospital, etc.)	The land in the vicinity of the airport is grassland and urban area.
Economy / Transport (Commerce, agriculture, industry, bus terminal, etc.)	The staple products of Urgench City are agriculture to cultivated cotton and rice plant, also to be produced with the textile industry. From the city center to the airport is accessable by general roads. There is little traffic on the road.
NATURAL ENVIRONMENT	
Item	Condition
Topography / Geology (steep slope, soft ground, wet land, faults, etc.)	The land in the vicinity of the airport is relatively flat.
Fauna and Flora and Their habitats (rare species, mangroves, coral reefs, etc.)	None
POLLUTION	
Item	Condition
Complaints (pollution of the uppermost concern, etc.)	None
Counter Measures (institutional measures, compensation, etc.)	None
Others (special mention items, etc.)	None

Table 5.3.14 Environmental Conditions (Nukus)

SOCIAL ENVIRONMENT	
Item	Condition
Inhabitant (residents, indigenous people, their view on the project, etc.)	There are residents in the vicinity of the airport.
Land Use (urban area, farmland, historic spot, scenic spot, hospital, etc.)	The land in the vicinity of the airport is grassland and urban area.
Economy / Transport (Commerce, agriculture, industry, bus terminal, etc.)	The staple products of Nukus City are agriculture to cultivated cotton and rice plant, also to be produced with the textile industry. From the city center to the airport is accessable by general roads. There is little traffic on the road.
NATURAL ENVIRONMENT	
Item	Condition
Topography / Geology (steep slope, soft ground, wet land, faults, etc.)	The land in the vicinity of the airport is relatively flat.
Fauna and Flora and Their habitats (rare species, mangroves, coral reefs, etc.)	None
POLLUTION	
Item	Condition
Complaints (pollution of the uppermost concern, etc.)	None
Counter Measures (institutional measures, compensation, etc.)	None
Others (special mention items, etc.)	None