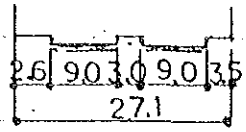
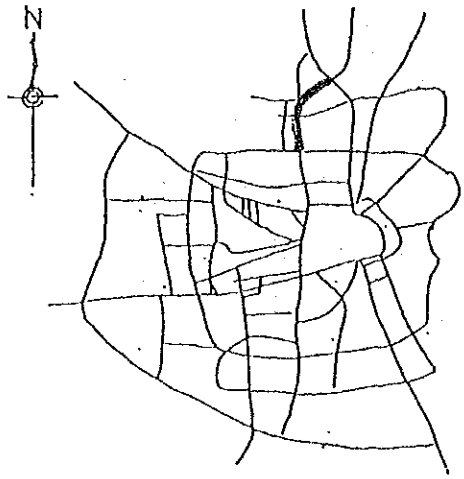
Appendix Table 12.2.1 Action Plan of Each Project

Project No. 1 Airport Road — Length: 1.8 km

Section	Sadah road - Ring road
Land use	Commercial, Public administration
Traffic volume (PCU)	33,000 - 34,900
Existing road section	

Location



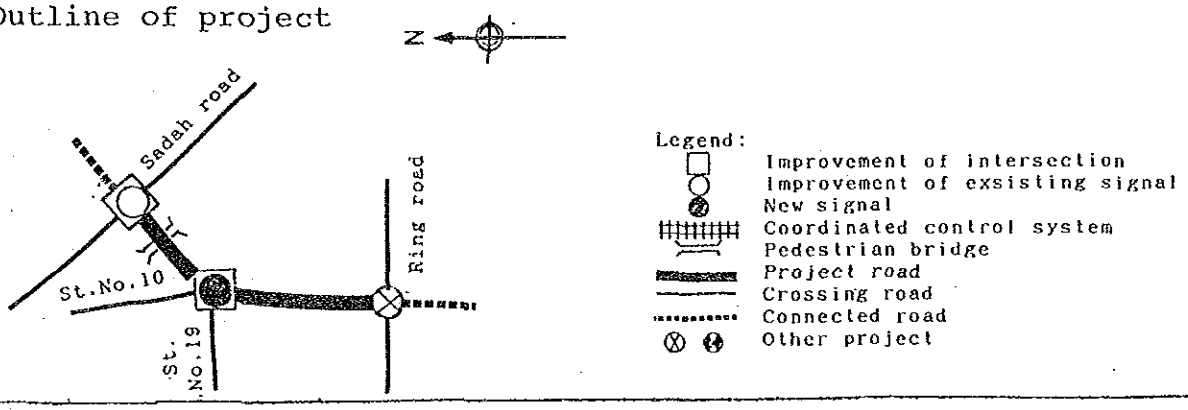
Main themes along the road

- Inducement of the subcenter

Aims of the project

- Keeping of the north-south route
- Improvement of pedestrian control
- Countermeasure for traffic accidents

Outline of project



Main works of project

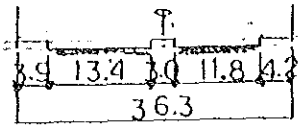
- Improvement of intersection	2 pls.
- New signal	2 pls.
- Pedestrian bridge	1 set

Project cost (Unit: thousand)

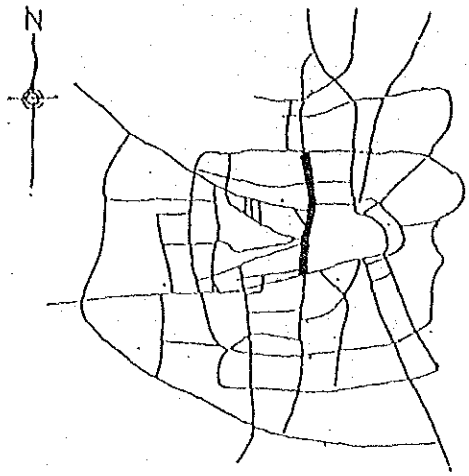
Foreign currency (U$)	Local currency (YR)	Total financial (YR)	Total economic (YR)
660.9	5,901.1	12,346.5	9,172.2

Appendix Table 12.2.1 Action Plan of Each Project

Project No. 2 Al Qiyada st. and Ali Abdul Mughni st. Length: 2.5 km

Section	Ring road - Az Zubayri st.
Land use	Commercial, Residential, Public administration
Traffic volume (PCU)	28,400 - 51,600
Existing road section	

Location



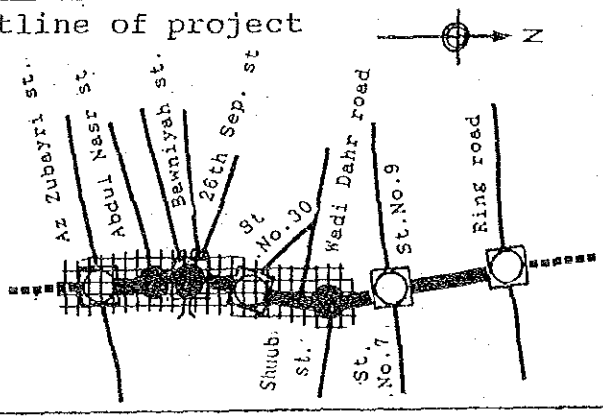
Main themes along the road

Redevelopment of commercial and business district
Preservation of Old Sana'a
Redevelopment of public transportation center

Aims of the project

Installation of traffic control system
Improvement of pedestrians control
Restriction of car parking on the road

Outline of project



Main works

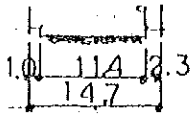
- Improvement of intersection	6 pls.
- New signal	7 pls.
- Pedestrian bridge	1 set
- Parking	1 set

Project cost (Unit: thousand)

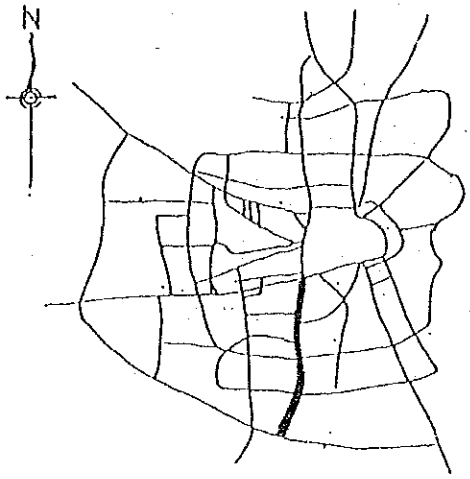
Foreign currency (US)	Local currency (YR)	Total financial (YR)	Total economic (YR)
2,041.4	63,607.5	83,515.0	51,387.1

Appendix Table 12.2.1 Action Plan of Each Project

Project No. 3 Old Airport Road — Length: 3.3 km

Section	Az Zubayri st. - Sana'a Bypass
Land use	Residential, Public administration, Institutional
Traffic volume (PCU)	6,900 - 27,600
Existing road section	

Location



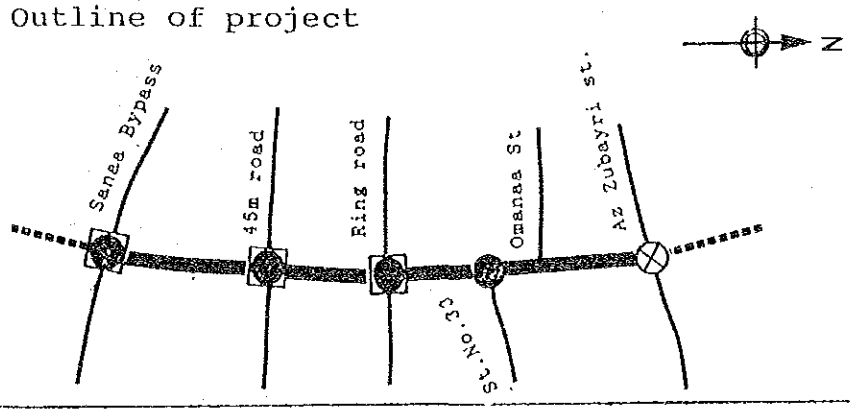
Main themes along the road

Tidy up park and keeping of preservation area

Aims of the project

Keeping of the north-south route

Outline of project



Main works

- Improvement of intersection 3 pls.
- New signal 4 pls.

Project cost

(Unit: thousand)

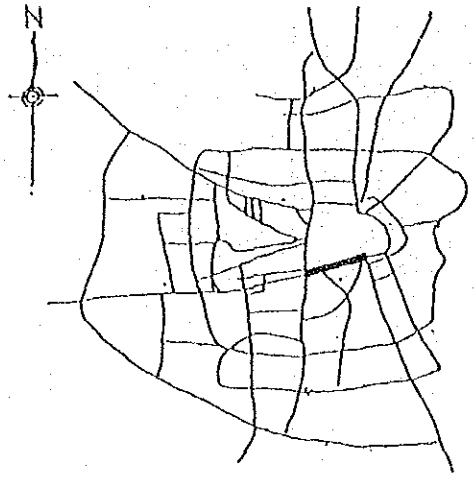
Foreign currency (U$)	Local currency (YR)	Total financial (YR)	Total economic (YR)
1,024.8	6,016.8	16,010.8	13,017.2

Appendix Table 12.2.1 Action Plan of Each Project

Project No.4 Az Zubayri Street — Length: [illegible] km

Section	Bab al Yemen – Ali Abdul mughni st.
Land use	Commercial, Public administration
Traffic volume (PCU)	52,400
Existing road section	

Location



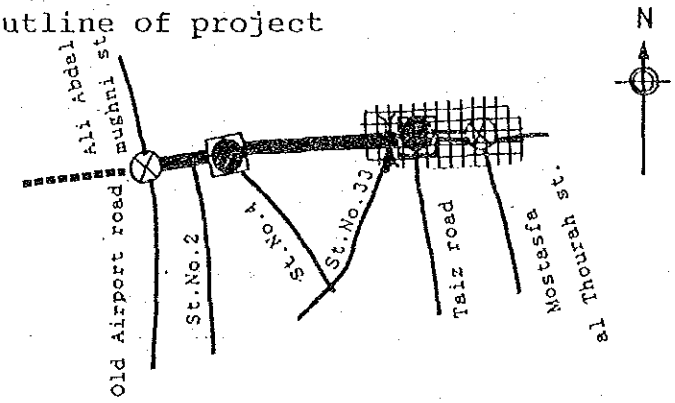
Main themes along the road

Redevelopment of public transportation center

Aims of the project

Keeping of the east-west route
Installation of traffic control system
Improvement of pedestrian control

Outline of project



Main works

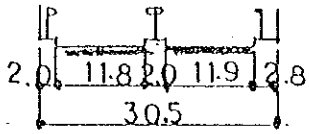
- Improvement of intersection	2 pls.
- New signal	2 pls.
- Pedestrian bridge	1 set

Project cost (Unit: thousand)

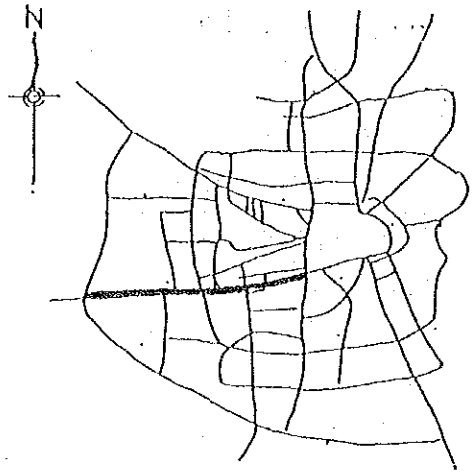
Foreign currency (U$)	Local currency (YR)	Total financial (YR)	Total economic (YR)
855.1	5,100.3	13,439.1	11,063.2

Appendix Table 12.2.1 Action Plan of Each Project

Project No. 5 Az Zubayri Street — Length: 4.1 km

Section	Ali Abdul Mughni st. - Sana'a Bypass
Land use	Commercial, Business, Light industrial
Traffic volume (PCU)	31,700 - 45,600
Existing road section	

Location



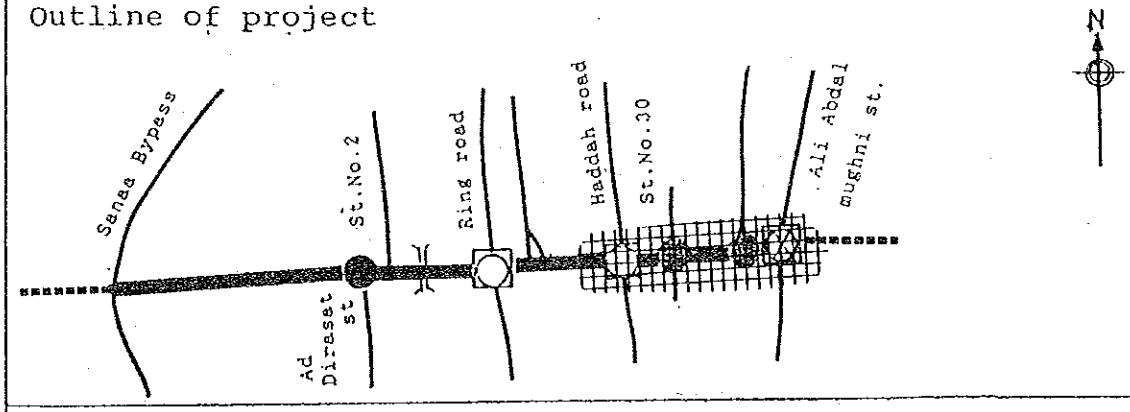
Main themes along the road

Improvement of environment in residential and commercial area.

Aims of the project

Keeping of the east-west route
Restriction of car parking on the road

Outline of project



Main works

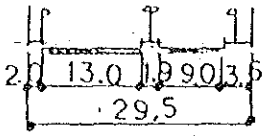
- Improvement of intersection	2 pls.
- New signal	5 pls.
- Pedestrian bridge	1 set
- Parking	1 set

Project cost (Unit: thousand)

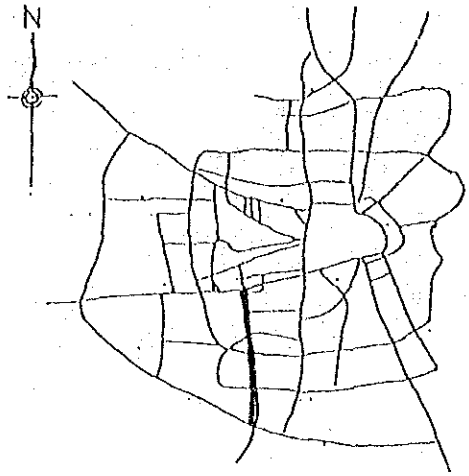
Foreign currency (U$)	Local currency (YR)	Total financial (YR)	Total economic (YR)
1,609.0	98,156.1	113,846.7	64,782.7

Appendix Table 12.2.1 Action Plan of Each Project

Project No.6 Haddah Road — Length: 2.9 km

Section	Az Zubayri st. – Sana'a bypass
Land use	Residential, Public administration, commercial
Traffic volume(PCU)	20,900 - 26,000
Existing road section	

Location



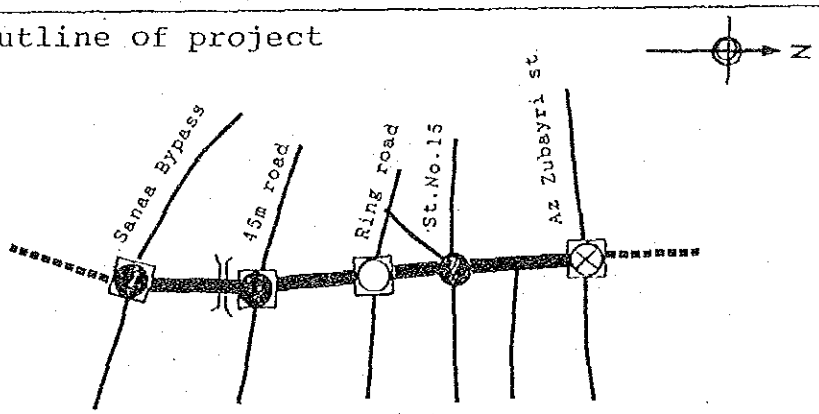
Main themes along the road

Development of residential area
Redevelopment of commercial area

Aims of the project

Improvement of pedestrian control
Efficient traffic flow control

Outline of project



Main works

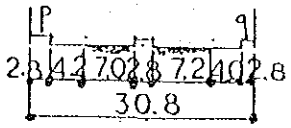
- Improvement of intersection	3 pls.
- New signal	4 pls.
- Pedestrian bridge	1 set

Project cost (Unit: thousand)

Foreign currency (U$)	Local currency (YR)	Total financial (YR)	Total economic (YR)
1,596.3	12,494.0	28,061.0	22,539.4

Appendix Table 12.2.1 Action Plan of Each Project

Project No.7 Taiz Road — Length: 4.0 km

Section	Bab al Yemen - Sana'a bypass
Land use	Commercial, Public administration
Traffic volume (PCU)	26,300 ~ 43,500
Existing road section	

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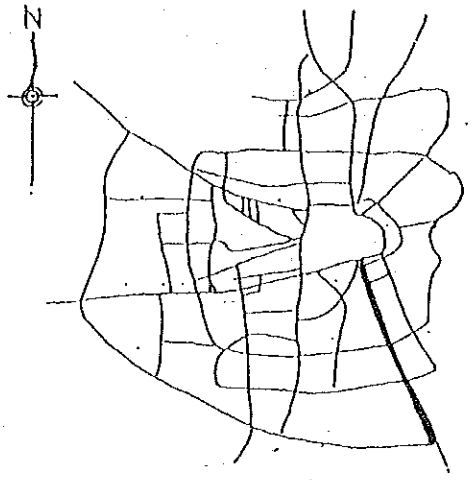


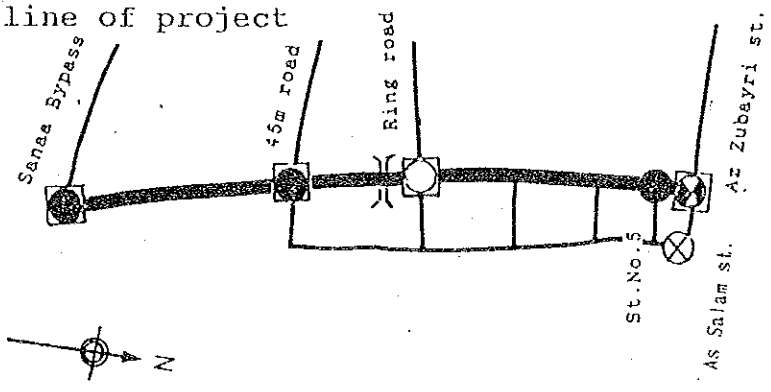
Main themes along the road

Redevelopment of commercial areas

Aims of the project

Improvement of pedestrian control
Efficient traffic flow control

Outline of project



Main works

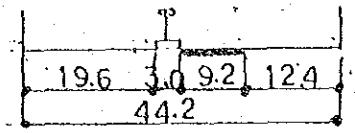
- Improvement of intersection 3 pls.
- New signal 4 pls.
- Pedestrian bridge 1 set

Project cost (Unit: thousand)

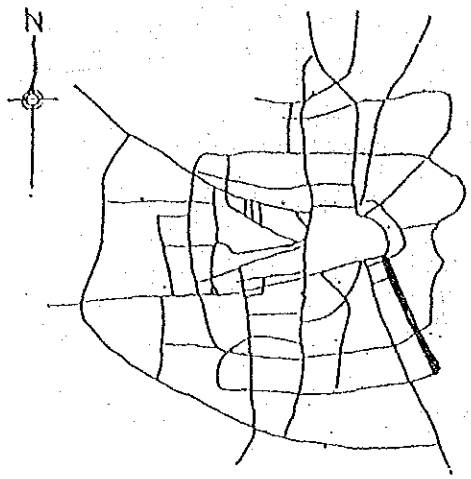
Foreign currency (US$)	Local currency (YR)	Total financial (YR)	Total economic (YR)
1,872.0	11,182.6	29,437.9	24,236.9

Appendix Table 12.2.1 Action Plan of Each Project

Project No. 8 Mostasfa al thourah street — Length: 2.5 km

Section	Bab as Salam – 45 m road
Land use	Commercial, Residential
Traffic volume (PCU)	22,800
Existing road section	

Location



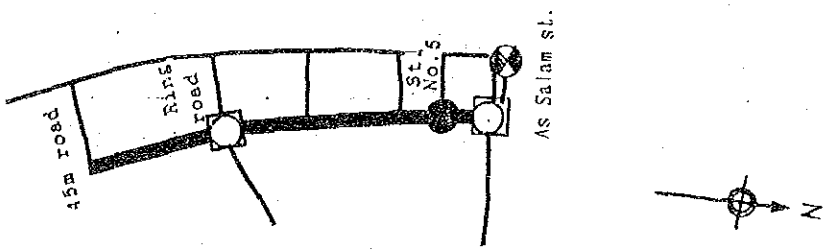
Main themes along the road

Development of commercial and residential

Aims of the project

Efficient traffic flow control

Outline of project



Main works

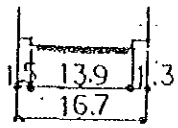
- Improvement of intersection 2 pls.
- New signal 3 pls.

Project cost (Unit: thousand)

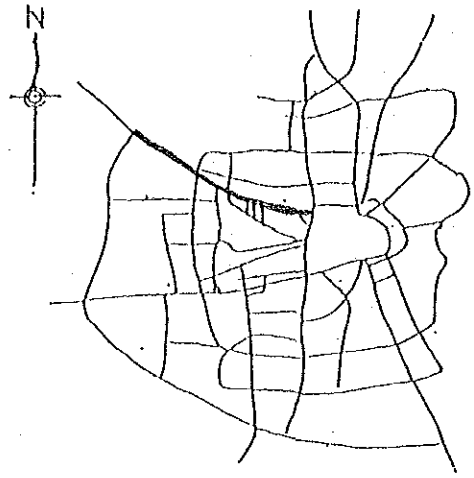
Foreign currency (U$)	Local currency (YR)	Total financial (YR)	Total economic (YR)
1,157.7	7,257.6	18,547.0	15,275.0

Appendix Table 12.2.1 Action Plan of Each Project

Project No.9 Wadi Dahr Road — Length: 3.6 km

Section	Ali Abdul Mughni st. - Sana'a bypass
Land use	Institutional, Public administration, residential
Traffic volume (PCU)	11,200 - 18,100
Existing road section	

Location



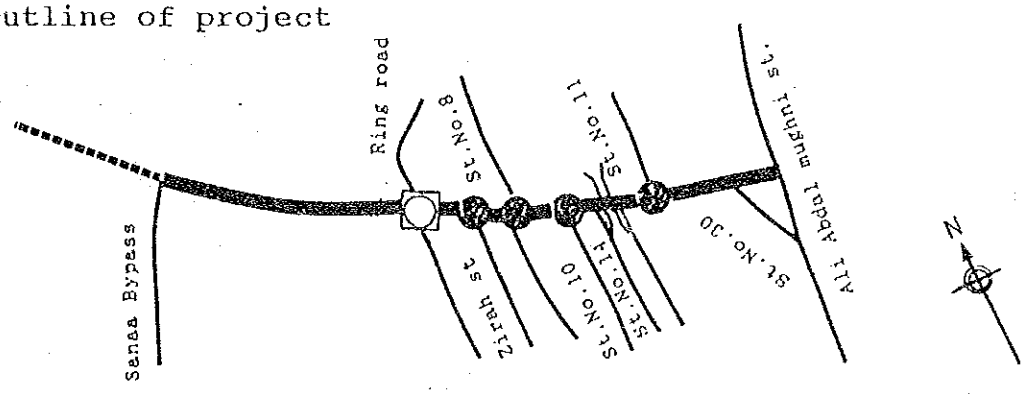
Main themes along the road

Construction of Sana'a university

Aims of the project

Improvement of approach road for university
Improvement of pedestrian control
Countermeasure for traffic accidents

Outline of project



Main works

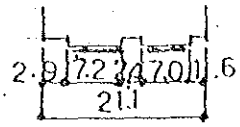
- Improvement of intersection	1 pls.
- New signal	5 pls.
- Pedestrian bridge	1 set

Project cost (Unit: Thousand)

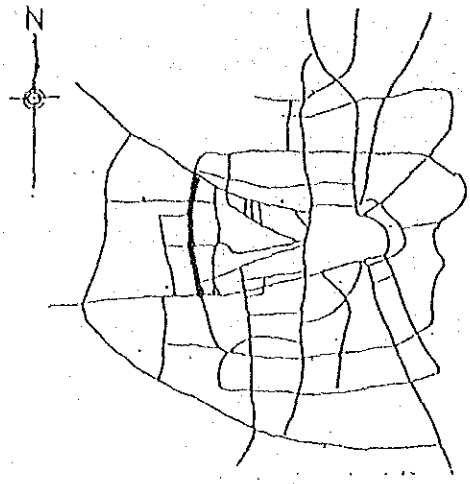
Foreign currency (US)	Local currency (YR)	Total financial (YR)	Total economic (YR)
820.7	4,426.2	12,429.2	9,807.9

Appendix Table 12.2.1 Action Plan of Each Project

Project No.10 Ring Road (West side) Length: km

Section	Az Zubayri st. - Wadi dahr road
Land use	Commercial, Institutional, Business
Traffic volume(PCU)	19,700 - 31,800
Existing road section	

Location



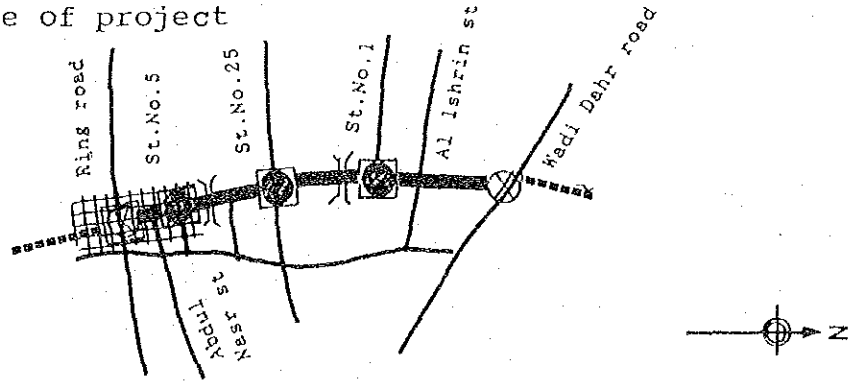
Main themes along the road

Redevelopment of commercial area

Aims of the project

- Keeping of ring road function
- Restriction of car parking on the road
- Improvement of pedestrian control

Outline of project



Main works

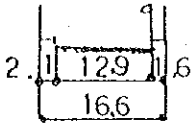
- Improvement of intersection	3 pls.
- New signal	3 pls.
- Pedestrian bridge	2 sets
- Parking	1 set

Project cost (Unit: thousand)

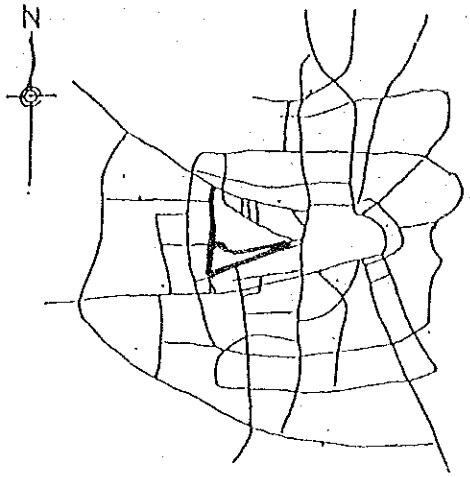
Foreign currency (U$)	Local currency (YR)	Total financial (YR)	Total economic (YR)
1,898.2	19,053.9	37,564.7	29,732.8

Appendix Table 12.2.1 Action Plan of Each Project

Project No.11 Zirah Street — Length: 1.7 km

Section	Abdul nasr st. - Wadi dahr road
Land use	Public administration, Institutional, commercial
Traffic volume(PCU)	12,700 - 13,900
Existing road section	

Location



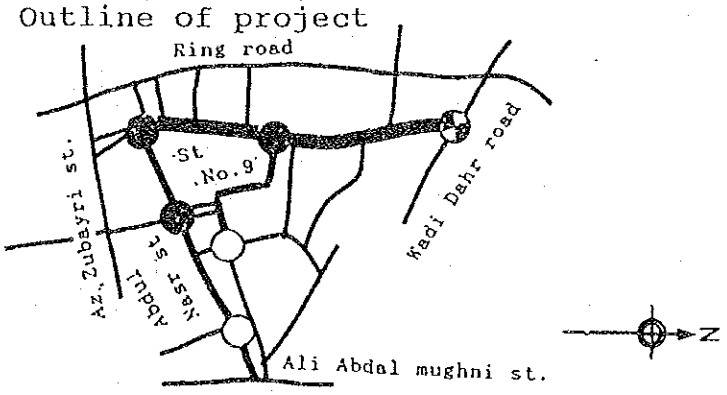
Main themes along the road

Vitalization of commercial area

Aime of the project

Countermeasure for traffic accidents

Outline of project



Main works

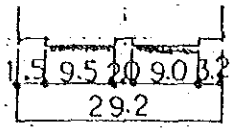
- New signal 5 pls.

Project cost (unit: thousand)

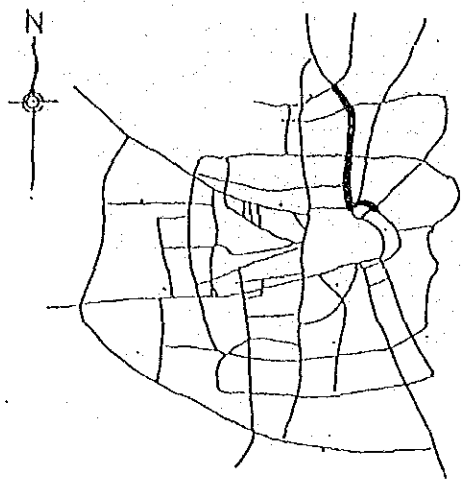
Foreign currency (U$)	Local currency (YR)	Total financial (YR)	Total economic (YR)
705.0	3,776.0	10,650.9	8,174.0

Appendix Table 12.2.1 Action Plan of Each Project

Project No. 12 Sadah Road — Length: 2.7 km

Section	Bab Shuub - Airport road
Land use	Commercial, Light industrial, residential
Traffic volume (PCU)	18,700 - 22,700
Existing road section	

Location



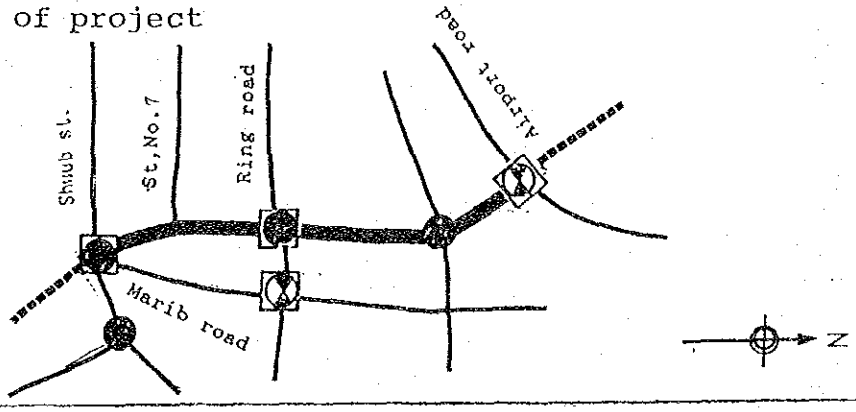
Main themes along the road

Improvement of environment in residencial area

Aims of the project

Efficient traffic flow control

Outline of project



Main works

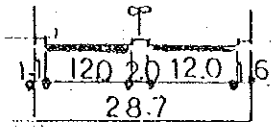
- Improvement of intersection 2 pls.
- New signal 4 pls.

Project cost (Unit: Thousand)

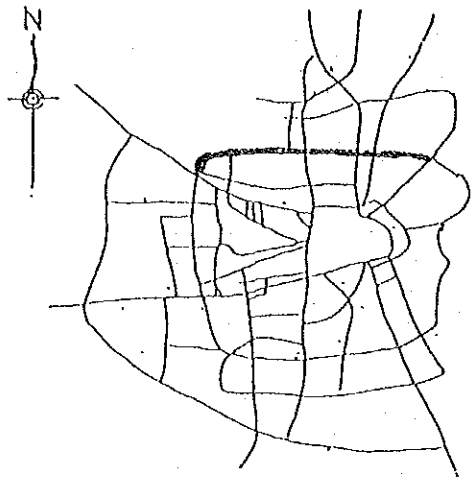
Foreign currency (U$)	Local currency (YR)	Total financial (YR)	Total economic (YR)
788.5	4,218.0	11,906.8	9,392.4

Appendix Table 12.2.1 Action Plan of Each Project

Project No.13 Ring Road (North side) Length: 4.9 km

Section	Wadi dahr road - Eastern road
Land use	Commercial, Residential
Traffic volume(PCU)	11,000 - 27,200
Existing road section	

Location



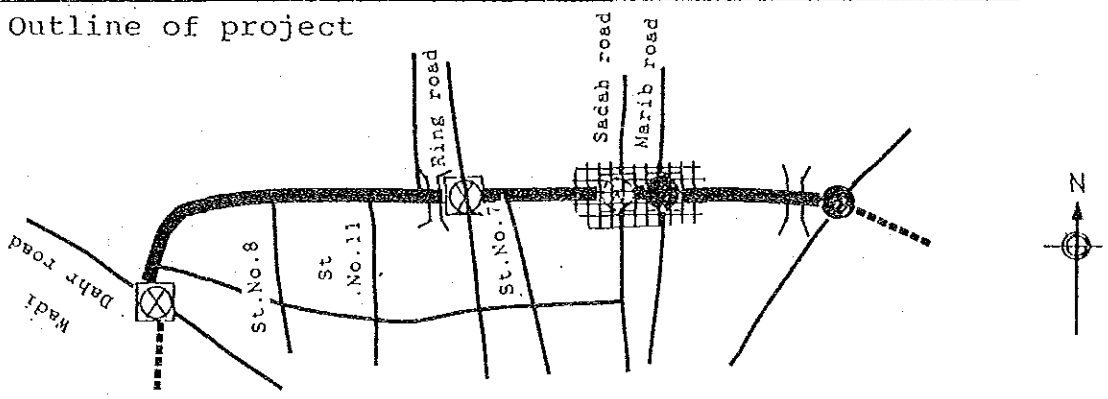
Main themes along the road

Development of commercial and residencial area
Redevelopment of public transportation center

Aims of the project

Keeping of ring road function
Countermeasure for traffic accidents
Implovement of pedestrian control

Outline of project



Main works

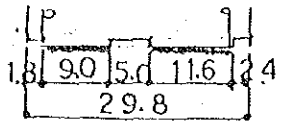
- Improvement of intersection	1 pls.
- New signal	2 pls.
- Pedestrian bridge	2 pls.

Project cost (Unit: thousand)

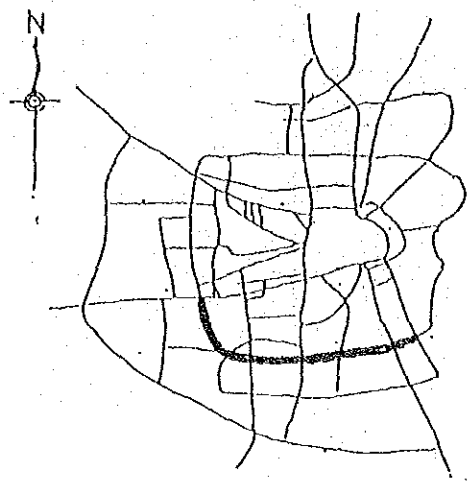
Foreign currency (U$)	Local currency (YR)	Total financial (YR)	Total economic (YR)
496.6	5,540.6	10,383.0	7,860.1

Appendix Table 12.2.1 Action Plan of Each Project

Project No.14 Ring Road (South side) — Length: 4.5 km

Section	Az Zubayri st. - Mostasfa al thourah st.
Land use	Residential, Public administration, Business
Traffic volume (PCU)	19,000 - 24,700
Existing road section	

Location



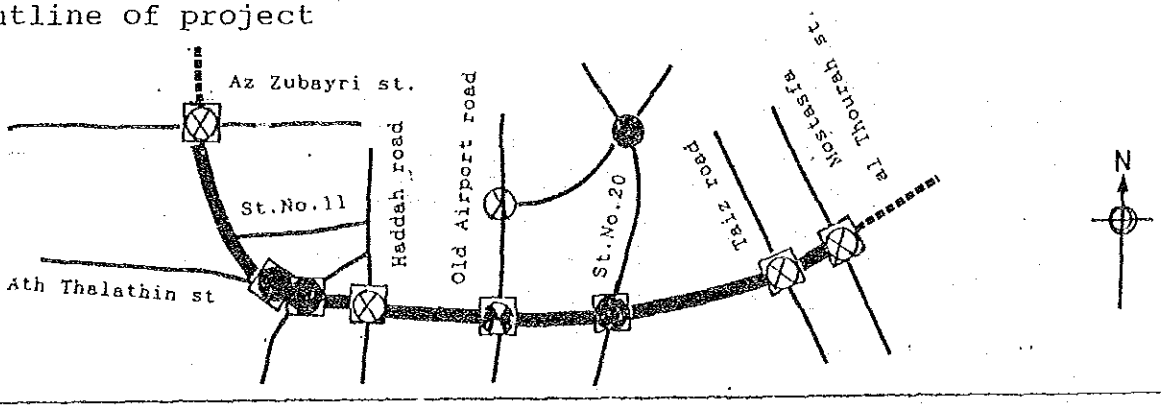
Main themes along the road

Improvement of environment in residencial area

Aims of the project

Keeping of ring road function
Countermeasure for traffic accident

Outline of project



Main works

- Improvement of intersection 3 pls.
- New signal 4 pls.

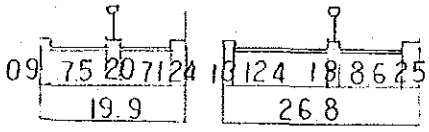
Project cost

(Unit: Thousand)

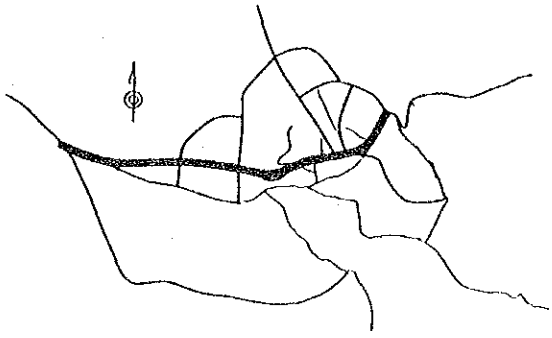
Foreign currency (U$)	Local currency (YR)	Total financial (YR)	Total economic (YR)
919.8	5,514.5	14,484.0	11,718.5

Appendix Table 12.2.1 Action Plan of Each Project

Project No. 15 Taiz — Length: 3.2 km

Section	Sana'a Ring Road Intersection - Southern Ring Road
Land use	Commercial
Traffic volume (PCU)	38,000 - 43,000
Existing road section	

Location



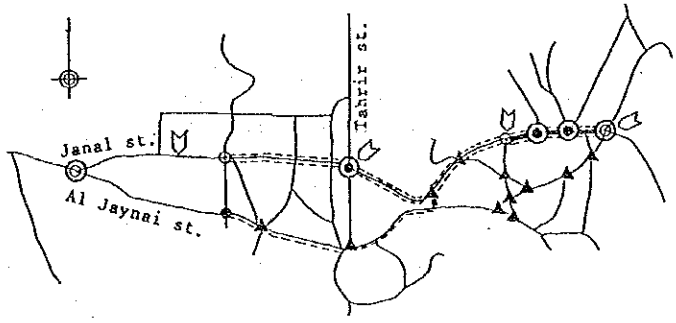
Main themes along the road

Improvement of environment in commercial area

Aims of the project

Keeping of east-west route
Restriction of car parking on the road

Outline of project



Legend

- Improvement of intersections (Channelization, widening approach)
- Newly signalized intersections
- Replacement of existing signals
- Coordinated signal control system
- Traffic signboards, etc.
- Safety devices (Pedestrian crossing, guard fence)
- ---- No-parking restriction

Main works

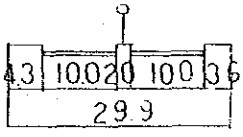
- Improvement of intersection	5 pls.
- New signal	7 pls.
- Parking	3 pls.
- Marking	

Project cost (Unit: thousand)

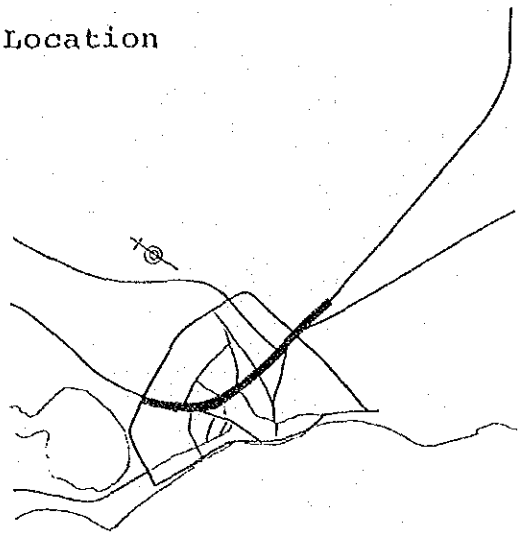
Foreign currency (U$)	Local currency (YR)	Total financial (YR)	Total economic (YR)
1,483.0	183,497.7	197,959.4	105,843.4

Appendix Table 12.2.1 Action Plan of Each Project

Project No. 16 Hodaidah — Length: 3.7 km

Section	Sana'a, Zaid and Intersection - Port. Zaid road Intersection
Land use	Commercial
Traffic volume (PCU)	30,000 - 35,000
Existing road section	

Location



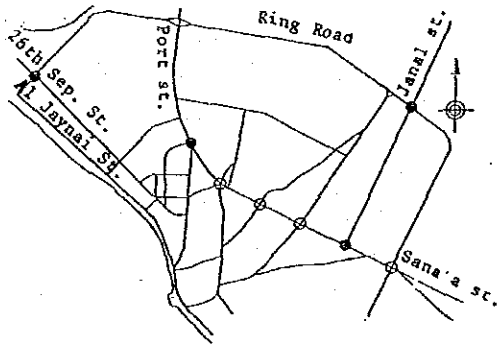
Main themes along the road

Vitalization of commercial area

Aims of the project

Efficient traffic flow control on east-west route

Outline of project



Legend

- Improvement of intersections (Channelization, widening approach)
- Newly signalized intersections
- Replacement of existing signals
- Coordinated signal control system
- Traffic signboards, etc.
- Safety devices (Pedestrian crossing, guard fence)
- No-parking restriction

Mainworks

- New signal 8 pls.
- Marking

Project cost (Unit: thousand)

Foreign currency (US)	Local currency (YR)	Total financial (YR)	Total economic (YR)
1,177.0	6,008 0	17,486.3	13,619.4

Appendix Note 12.1 Machine Cost Calculation

Calculation of machine cost followed a common method as shown below using the computer system. Cost is calculated for the each item in the following and the accumulated cost is shown in Table 12.1.3 of the Main Report.

(1) Cost of depreciation
= Basic price x 0.9 / (Operation hour par year x Operational life)

(2) Cost of maintenance
= Basic price x Overall maintenance rate / (Annual average operational hour x operational life)

(3) Cost of management
= Basic price x Rate of annual management / 100.0 / Annual average operation hour

(4) Cost of parts
= Basic price of spare parts / Total operational hour

(5) Cost of replacement work of spare parts
= Fee of replacement / Total operational hour

(6) Interest cost
= Basic price x ½ x (1.0 - Residual ratio) x Rate of interest / Annual average operational hour

(7) Cost of fuel consumption (foreign and local)
= Fuel consumption volume x Price

(8) Cost of fuel consumption (Tax)
= Price x Rate of Tax / 100.0

(9) Cost of Lubricant (foreign and local)
= Lubricant consumption rate x Price / 100.0

(10) Cost of Lubricant (Tax)
= Price x Rate of Tax / 100.0

Appendix Table 12.(1) Asphalt Pavement A-2

Per 1 SQM

Description	Unit	Quantity	Unit Price Foreign	Unit Price Local Financial	Unit Price Local Economic	Total Price Foreign	Total Price Local Financial	Total Price Local Economic
Material								
Agg. Subbase course	CUM	0.20	39.40 1)	241 1)	150 1)	7.88	48	30
Hand BT Base Course	CUM	0.15	47.53 2)	565 2)	398 2)	7.13	85	60
Hand Asphalt Surf.	CUM	0.10	53.85 3)	616 3)	437 3)	5.39	62	44
Seal Coating	SQM	1.00	0.38 4)	2 4)	2 4)	0.38	2	2
Prime Coating	SQM	1.00	0.19 5)	1 5)	1 5)	0.19	1	1
Hand Excavation	CUM	0.45	3.03 6)	59 6)	53 6)	1.36	27	24
Miscellaneous	%	0.00	0.00	0	0	0.00	0	0
Total						22.33	224	160
Per 1 SQM						22.33	224	160

Notes: 1)-6) are from the following Tables 12.(1).1)-6).

Appendix Table 12.(1).1) Agg. Subbase Course

Per 318.5 CUM

Description	Unit	Quantity	Unit Price Foreign	Unit Price Local Financial	Unit Price Local Economic	Total Price Foreign	Total Price Local Financial	Total Price Local Economic
Equipment								
Agg. Spreader 2.3m	hour	7.00	1.37	1	1	9.59	7	7
Motor Grader 3.7m	hour	7.00	34.03	29	8	238.21	203	56
Tire Roller 15t	hour	7.00	41.86	30	6	293.02	210	42
Tire Roller 15t	hour	7.00	41.86	30	6	293.02	210	42
Mac. Roller 12t	hour	7.00	17.96	16	6	125.72	112	42
Soil Compacter 0.2t	hour	7.00	1.73	2	1	12.11	14	7
Wheel Loader 1.4m3	hour	8.40	20.51	1893	479	172.28	15901	4024
Dump Truck 6t	hour	21.00	9.46	12	5	198.65	252	105
Dump Truck 11t	hour	50.00	18.86	20	7	943.00	1000	350
Miscellaneous	%	2.00	0.00	0	0	45.71	358	93
Material								
Screened Aggregate	CUM	318.50	31.45	164	116	10016.70	52256	37038
Miscellaneous	%	2.00	0.00	0	0	200.33	1045	741
Labour								
Operater	hour	43.40	0.00	47	47	0.00	2040	2040
Driver	hour	50.00	0.00	31	31	0.00	1550	1550
Driver	hour	21.00	0.00	31	31	0.00	651	651
Unskilled Labour	hour	14.00	0.00	24	22	0.00	336	308
Foreman	hour	8.00	0.00	47	47	0.00	376	376
Miscellaneous	%	5.00	0.00	0	0	0.00	248	246
Total						12548.30	76769	47718
Per 1 CUM						39.40	241	150

Appendix Table 12.(1).2) Hand BT Base Course — Per 35 CUM

Description	Unit	Quantity	Unit Price Foreign	Unit Price Local Financial	Unit Price Local Economic	Total Price Foreign	Total Price Local Financial	Total Price Local Economic
Equipment								
Soil Compacter 0.2t	hour	0.30	1.73	2	1	0.52	1	0
Dump Truck 2t	hour	7.00	4.72	11	7	33.04	77	49
Miscellaneous	%	2.00	0.00	0	0	0.67	2	1
Material								
BT Aggregate	CUM	35.00	44.33	414	265	1551.58	14492	9262
Miscellaneous	%	5.00	0.00	0	0	77.58	725	463
Labour								
Driver	hour	7.00	0.00	31	31	0.00	217	217
Unskilled Labour	hour	144.00	0.00	24	22	0.00	3456	3168
Foreman	hour	15.00	0.00	47	47	0.00	705	705
Miscellaneous	%	2.00	0.00	0	0	0.00	88	82
Total						1663.39	19761	13947
Per 1 CUM						47.53	565	398

Appendix Table 12.(1).3) Hand Asphalt Surf. — Per 35 CUM

Description	Unit	Quantity	Unit Price Foreign	Unit Price Local Financial	Unit Price Local Economic	Total Price Foreign	Total Price Local Financial	Total Price Local Economic
Equipment								
Dump Truck 2t	hour	7.00	4.72	11	7	33.04	77	49
Soil Compacter 0.2t	hour	0.30	1.73	2	1	0.52	1	0
Miscellaneous	%	2.00	0.00	0	0	0.67	2	1
Material								
Asphalt Concrete	CUM	35.00	50.36	464	303	1762.54	16236	10589
Miscellaneous	%	5.00	0.00	0	0	88.13	812	529
Labour								
Driver	hour	7.00	0.00	31	31	0.00	217	217
Unskilled Labour	hour	142.00	0.00	24	22	0.00	3408	3124
Foreman	hour	15.00	0.00	47	47	0.00	705	705
Miscellaneous	%	2.00	0.00	0	0	0.00	87	81
Total						1884.90	21544	15296
Per 1 CUM						53.85	616	437

Appendix Table 12.(1).4) Seal Coating — Per 1000 SQM

Description	Unit	Quantity	Unit Price Foreign	Unit Price Local Financial	Unit Price Local Economic	Total Price Foreign	Total Price Local Financial	Total Price Local Economic
Equipment								
Road Sweeper 1.8m	hour	1.00	40.38	35	9	40.38	35	9
Distributer 4kl	hour	0.40	13.01	7	1	5.20	3	0
Sprayer 0.3kl	hour	1.00	0.73	1	0	0.73	1	0
Dump Truck 2t	hour	3.20	4.72	11	7	15.10	35	22
Tire Roller 15t	hour	1.90	41.86	30	6	79.53	57	11
Miscellaneous	%	2.00	0.00	0	0	2.82	3	1
Material								
Asphalt Emulsion-2	Lit	702.00	0.18	1	1	126.36	702	702
Screened Crusher	CUM	6.30	15.12	102	73	95.26	643	460
Miscellaneous	%	5.00	0.00	0	0	11.08	67	58
Labour								
Operater	hour	1.90	0.00	47	47	0.00	89	89
Driver	hour	3.20	0.00	31	31	0.00	99	99
Unskilled Labour	hour	5.10	0.00	24	22	0.00	122	112
Miscellaneous	%	5.00	0.00	0	0	0.00	16	15
Total						376.47	1872	1580
Per 1 SQM						0.38	2	2

Appendix Table 12.(1).5) Prime Coating — Per 1000 SQM

Description	Unit	Quantity	Unit Price Foreign	Unit Price Local Financial	Unit Price Local Economic	Total Price Foreign	Total Price Local Financial	Total Price Local Economic
Equipment								
Road Sweeper 1.8m	hour	0.80	40.38	35	9	32.30	28	7
Distributer 4kl	hour	0.30	13.01	7	1	3.90	2	0
Sprayer 0.3kl	hour	0.80	0.73	1	0	0.58	1	0
Miscellaneous	%	2.00	0.00	0	0	0.74	1	0
Material								
Asphalt Emulsion-2	Lit	820.00	0.18	1	1	147.60	820	820
Miscellaneous	%	5.00	0.00	0	0	7.38	41	41
Labour								
Unskilled Labour	hour	3.50	0.00	24	22	0.00	84	77
Miscellaneous	%	5.00	0.00	0	0	0.00	4	4
Total						192.51	981	950
Per 1 SQM						0.19	1	1

Appendix Table 12.(1).6) Hand Excavation — Per 1000 CUM

Description	Unit	Quantity	Unit Price Foreign	Unit Price Local Financial	Unit Price Local Economic	Total Price Foreign	Total Price Local Financial	Total Price Local Economic
Equipment								
Concrete Cutter 0.3m	hour	140.00	2.48	1	1	347.20	140	140
Conc. Breaker 30kg	hour	140.00	0.33	0	0	46.20	0	0
Compressor 4.6m3	hour	140.00	5.55	11	6	777.00	1540	840
Belt Con. 0.35*10m	hour	280.00	2.03	3	1	568.40	840	280
Dump Truck 6t	hour	130.00	9.46	12	5	1229.80	1560	650
Miscellaneous	%	2.00	0.00	0	0	59.37	82	38
Material								
Miscellaneous	%	0.00	0.00	0	0	0.00	0	0
Labour								
Driver	hour	130.00	0.00	31	31	0.00	4030	4030
Unskilled Labour	hour	1694.00	0.00	24	22	0.00	40656	37268
Foreman	hour	182.00	0.00	47	47	0.00	8554	8554
Miscellaneous	%	3.00	0.00	0	0	0.00	1597	1496
Total						3027.97	58999	53296
Per 1 CUM						3.03	59	53

Appendix Note 12.2 Work Cost Calculation

Cost of civil work is calculated for each classified item. Examples of the asphalt pavement A-2 per m^2 and a traffic signal set are shown below.

(1) Asphalt pavement A-2

Appendix Table 12.(1) is the summary of cost elements and the each element is based on the work and materials in Appendix Table 12.(1),1) through 12.(1),6).

(2) Traffic Signal (1) per one intersection

Appendix Table 12.(2) is the cost elements summarized from Appendix Tables 12.(2).1) - 3).

Appendix Table 12.(2) Traffic Signal (1)

Per 1 PLS

Description	Unit	Quantity	Unit Price Foreign	Unit Price Local Financial	Unit Price Local Economic	Total Price Foreign	Total Price Local Financial	Total Price Local Economic
Material								
Signal (Ve.)	SET	9.20	2300.00	9385	23	21160.00	86342	212
Signal (Arrow)	SET	8.00	790.00	3223	8	6320.00	25784	64
Signal (Ped.)	SET	8.10	1200.00	4892	8	9720.00	39625	65
Miscellaneous	%	10.00	0.00	0	0	7034.41	36479	10782
Footing and Election	PLS	12.00	1075.35 1)	4440 1)	1472 1)	12904.30	53275	17665
Plumbing	M	310.00	22.63 2)	336 2)	280 2)	7076.22	104092	86695
Wiring	M	340.00	1.95 3)	14 3)	9 3)	663.66	4784	3121
Controller (Link)	SET	1.00	12500.00	50883	0	12500.00	50883	0
Total						77378.60	401264	118604
Per 1 PLS						77378.60	401264	118604

Notes: 1)-3) are from the following Table 12.(2).1)-3).

Appendix Table 12.(2).1) Footing and Election

Per 1 PLS

Description	Unit	Quantity	Unit Price Foreign	Unit Price Local Financial	Unit Price Local Economic	Total Price Foreign	Total Price Local Financial	Total Price Local Economic
Equipment								
Truck Crane 5t	hour	0.80	18.15	10	2	14.52	8	2
Material								
Taper Pole	PCS	1.00	861.00	2457	40	861.00	2457	40
Miscellaneous	%	15.00	0.00	0	0	138.37	469	86
Hand Excavation	CUM	2.00	3.03	59	53	6.06	118	107
Hand Backfill	CUM	1.50	0.11	36	33	0.17	54	50
Foundation Concrete	CUM	0.50	46.90	326	244	23.45	163	122
Sidewalk Pavement	SQM	0.40	9.59	161	139	3.84	64	56
Concrete Curb	LM	3.30	8.47	82	61	27.95	271	200
Labour								
Driver	hour	0.80	0.00	31	31	0.00	25	25
Skilled Labour	hour	13.60	0.00	37	37	0.00	503	503
Unskilled Labour	hour	12.80	0.00	24	22	0.00	307	282
Total						1075.35	4440	1472
Per 1 PLS						1075.35	4440	1472

Appendix Table 12.(2).2) Plumbing

Per 100 M

Description	Unit	Quantity	Unit Price Foreign	Unit Price Local Financial	Unit Price Local Economic	Total Price Foreign	Total Price Local Financial	Total Price Local Economic
Material								
PVC Conduit	LM	100.00	5.58	17	1	558.00	1700	100
Miscellaneous	%	10.00	0.00	0	0	207.51	2824	2314
Hand Excavation	CUM	25.00	3.03	59	53	75.70	1475	1332
Hand Backfill	CUM	25.00	0.11	36	33	2.83	900	834
Sidewalk Pavement	SQM	150.00	9.59	161	139	1438.61	24164	20870
Labour								
Skilled Labour	hour	68.00	0.00	37	37	0.00	2516	2516
Total						2282.65	33578	27966
Per 1 M						22.83	336	280

Appendix Table 12.(2).3) Wiring

Per 100 M

Description	Unit	Quantity	Unit Price Foreign	Unit Price Local Financial	Unit Price Local Economic	Total Price Foreign	Total Price Local Financial	Total Price Local Economic
Equipment								
		0.00	0.00	0	0	0.00	0	0
Material								
CV Cable 14A	LM	105.00	1.69	5	1	177.45	525	105
Miscellaneous	%	10.00	0.00	0	0	17.75	53	11
Labour								
Skilled Labour	hour	13.60	0.00	37	37	0.00	503	503
Unskilled Labour	hour	13.60	0.00	24	22	0.00	326	299
Total						195.20	1407	918
Per 1 M						1.95	14	9

APPENDIX TO CHAPTER 13

Appendix Note 13.1. Vehicle Operation Cost

Vehicle operation cost (VOC) is studied in order to quantify the effect of urgent action plans in economic cost-benefit analysis. The methodology of VOC determination is based on Volumes 1 & 2 Motor Vehicle Operating Cost of the report "Development National Highway Master Plan" (Dar Al Handasah Consultants, February 1985), herein after called "Highway Master Plan 1985", and the consultant's studies in other countries.

Some factors which are taken into account of the calculation are noted as follows:-

- Vehicle import license of private use has not been issued since January 1986. Under the circumstances, vehicle prices for 1987 are determined by considering the change in foreign exchange rate during the years of 1984-1987 and local prices in Japan.
- Highway Master Plan 1985 contains a study of VOC on inter-city roads. Representative vehicles, surface and other road conditions are different when the study is for in-city traffic problems. Running mileage per year is also different between the in-city and the inter-city use.
- Urban major road network on which urgent action plans are studied is already surfaced mostly, while there are a number of streets graval/earth surfaced. VOC is determined for the travelling on the surfaced urban streets at different speeds since plans of improvement are associated with surfaced roads.

1) Representative Vehicles

Representative vehicles of in-city traffic movement are shown in Appendix Table 13.1.1. Their economic net cost is decided by the cost arriving at Hodeidah Port. Financial cost is calculated by adding duty and tax portion.

2) Vehicle Life

Use of vehicles on urban streets is different from those on inter-city highways. Accordingly, the figures in Highway Master Plan 1985

Appendix Table 13.1.1 Representative Vehicles

	Financial Cost,1984 1)	Economic Cost,1984	Fin/Eco in 1984	Financial Cost,1987 3)	Economic Cost,1987 4)	Fin/Eco in 19847
Car,Cressida	62000	34000	1.82	380000	154000	2.47
Car,Land Cruiser	90000	50000	1.80	494000	200000	2.47
Taxi,Cressida	62000	34000	1.82	380000	154000	2.47
Micro-bus,Daihatsu	92000	63000	1.46	162000	72000	2.25
Medium-bus,Coaster	120000	82000	1.46	550000	250000	2.20
Light truck,Hilux	56000	38000	1.47	180000	73000	2.47
Medium Tr.NissanCK80	290000	220000	1.32	795000	425000	1.87

Note :
1) From Highway Master Plan 1985
2) Cost in ( ) are not shown in the above report 1985 but filled in through the interview by the Study Team.
3) Financial cost in 1987 is calculated by adding duty/tax element. (Market price is said two or three times higher because of import limit.) Local tax of 12 % and import duties are added.
(Customs Department , 1987)
4) Economic cost in 1987 is assumed at the cost of arrival in Hodeidah. Tire cost included.
Changes in foreign exchange rate are found at US$ 1.00=YR 5.86 in 1984 and US$ 1.00=YR 9.85 in 1987. Prices in YR of 1987 are assumed at (1984)*(9.85/5.86)*1.15, where 1.15 is the net cost increase caused by new model production.

Appendix Table 13.1.2 Vehicle Life

Type	Seats/Ton 1)	Life Years	Annual km	Life km 2)	Remark	Fuel	CRF	CRF/1000km
Car	5 s	8	10000	80000	Cresseda	Petrol	0.187	0.0187
Land Crus.	9 s	8	10000	80000	Toyota 4WD	-do-	0.187	0.0187
Taxi	5 s	6	30000	180000	Cressida	-do-	0.230	0.0077
Micro bus	8 s	6	30000	180000	Daihatsu 850	-do-	0.230	0.0077
Medium bus	25 s	6	30000	180000	Coaster	-do-	0.230	0.0077
Light Tr.	1.0 t	8	15000	120000	Hilux	-do-	0.187	0.0125
Medium Tr.	6.0 t	8	15000	120000	Nissan CK2	Diesel	0.187	0.0125

Note :
1) s : Seats including driver ; t : Capacity tons.
2) Highway Master Plan 1985 assumed larger life kms because vehicles move inter-city highways. Tis study assumes those moving within-city area, resulting in less life km.

wewe revised. Annual kilometres and life years in use adopted for urban traffic are shown in Appendix Table 13.1.2.

3) Tire Prices

Import of tires are also under the constraint of import policy. Prices of tires are shown in Appendix Table 13.1.3, where life km of a tire is also shown.

4) Fuel and Engine Oil

Prices of petrol, diesel and engine oil are determined by the Government, being shown in Appendix Table 13.1.4. Consumption rates of engine oil are shown in Appendix Table 13.1.5 referring to Highway Master Plan Study of 1985. Those rates are reorganized to the consumption on urban streets as shown in Appendix Table 13.1.6.

5) Spare Parts and Labor, etc.

Spare parts and maintenance labor costs are obtained from the same previous study of 1985. Depreciation is calculated by using capital recovery factors. Crew cost is also determined. They are in Appendix Tables 13.1.7 and 13.1.8.

6) Changes of VOC by Speed

VOC changes when travel speed changes. Changes in VOC are estimated by referring to Appendix Table 13.1.9 and the result is shown in Appendix Table 13.1.10.

7) Shadow Pricing

The above studies of VOC 1) - 5) indicate the net cost excluding customs and tax elements. When shadow pricing approach is adopted to foreign currency factor and unskilled labor cost, the followings should be taken into account.

- Foreign Currency Component

YAR controls import and foreign exchange rate. Accordingly, the exchange rate will not represent the rating of Y.R. in foreign currency market. An economic rate of exchange without control policies are calculated in the following SCF formula:

Appendix Table 13.1.3 Tire Cost

(YR in 1987)

		Car	Land Cru.	Taxi	Micro bus	Medium bus	Light Tr.	Medium Tr.
One tyre (1984)	1)	400	530	400	-	-	340	1500
One tyre (1987)	2)	700	1000	700	500	1200	650	1700
Exclude D & T	3)	510	730	510	370	880	470	1240
Total Fin.(1987)	4)	2800	4000	2800	2000	4800	2600	10200
Total Econ.(1987)	4)	2040	2920	2040	1480	3520	1880	7440
(Life km in '000)	5)	15	15	30	30	20	15	20
No. of tyres		4	4	4	4	4	4	6

Note : 1) From Highway Master Plan 1985. Foreign exchange rate was YR 5.86 in 1984 and YR 9.90 in 1987 in terms of US$ 1.00.
2) Interview on dealers and drivers.
3) Duty 25% and tax 12% (Customs Dept., 1987)
4) For all tyres.
5) Assumed fair paved roads (roughness 3000-3500) in urban area.

Appendix Table 13.1.4 Fuel and Oil

(YR/l , 1987)

	financial	Duty/tax	Economic	Remark
Petrol	3.05	0.91	2.14	
Diesel	2.05	0.20	1.85	
Oil	25.10	5.00	20.10	

Source : Customs Dept. , 1987

Appendix Table 13.1.5 Engine Oil Consumption

Type	l/1000km	
Car, taxi	1.2	1)
Micro bus, Light Tr.	1.8	1)
Medium bus	2	2)
Land Cru. Medium Tr.	2.6	2)

Note : 1) From Highway Master Plan 1985
2) By the Study Team

Appendix Table 13.1.6 Fuel Consumption on In-city Streets

km/h	Car	Land Cru.	Taxi	Micro B	Medium B	Light Tr.	Medium Tr.
10	171.6	235.3	171.6	171.6	235.3	171.6	343.2
15	126.1	213.2	126.1	126.1	213.2	126.1	247.2
20	106.6	191.1	106.6	106.6	191.1	106.6	200.4
25	97.5	180.7	97.5	97.5	180.7	97.5	176.4
30	78.2	150.7	78.2	78.2	150.7	78.2	133.6
40	74.8	126.5	74.8	74.8	126.5	74.8	128.7
50	77.1	128.8	77.1	77.1	128.8	77.1	136.5
60	73.0	119.0	73.0	73.0	119.0	73.0	117.8
70	81.0	124.0	81.0	81.0	124.0	81.0	135.8

Note: 1) From the Table A below "Car" is adopted to Car, Taxi, micro bus, light truck, "Light Vehicle" is adopted to Land Cruiser, Medium bus and "Bus/Truck" is adopted to Medium truck reduced by 1/4. Travelling on surfaced streets is assumed. Also, rates are modified to demonstrate larger consumption at low travel speed and frequent stoppings in urban area by refering to Feasibility Study on the Second Stage Expressway System in the Greter Bangkok (ETA-JICA, 1983)

Table A. Fuel consumptions on Inter-city Highways

km/h	"Car"	"L-Veh."	"Bus/Tru."
10	132	181	286
15	97	164	206
20	82	147	167
25	75	139	147
30	68	131	137
40	65	110	132
50	67	112	140
60	73	119	157
70	81	124	181
80	92	133	211
90	104	143	246
100	119	156	287
110	135	170	333
120	153	186	-
130	173	204	-
140	194	224	-

Appendix Table 13.1.7 Spare Parts and Labor

	Spare Parts 2) YR/10000YR/1000km	Labor 3) Hr/1000km
Car 1) (Car,Taxi,Micro B,Light Tr.)	13	0.8
Light Vehicle 1) (Land cruiser,Medium bus)	19	1.2
Heavy truck 1) (Medium truck)	11	3

Note : 1) From Highway Master Plan 1985.
2) YR per YR10,000 of the purchased price per 1000km
3) Hour per 1,000 km, labor=YR 30 /hour.
Both items are calculated st 40km/h and assumed to be constant irrespective of travel speed.

Appendix Table 13.1.8 Crew Cost and Over-Head Cost

	1) Crew Cost (YR/hour)	2) Over- Head Cost (%)
Taxi	28.6	5
Micro bus	28.6	5
Medium bus	42.9	10
Medium tr.	53.6	10

Note : 1) Monthly wage including fringe income is assumed at YR 4000 for taxi and buses, and YR 5000 for medium truck. Work hour is 7 hr*20 days=140 H/m.
An assistant is assumed for medium bus and medium truck with the wage rate 1/2.
2) From Highway Master Plan 1985

Appendix Table 13.1.9 Vehicle Efficiency Ratio by Travel Speed

km/hour	Car,Taxi Mic-B,Li-T	Lan Cru, Medium bus	Medium truck
5	0.755	0.577	0.697
10	0.777	0.615	0.729
15	0.799	0.653	0.761
20	0.821	0.691	0.793
25	0.843	0.729	0.825
30	0.865	0.767	0.857
35	0.888	0.806	0.888
40	0.910	0.845	0.911
45	0.933	0.884	0.933
50	0.955	0.922	0.955
55	0.978	0.961	0.977
60	1.000	1.000	1.000
65	1.011	1.039	1.023
70	1.022	1.078	1.045

Source: Feasibility Study on the Second Stage Expressway System in the Greater Bangkok (ETA-JICA, 1983)

Appendix Table 13.1.10 VOC Net Economic Cost

(YR/1000km)

Travel Spped	Motor Cycle	Car	Taxi	Micro Bus	Medium Bus	Light Truck	Medium Truck	Average
5	1540.54	5358.12	3431.80	2446.08	7046.83	1922.14	12323.40	3727.96
10	1472.48	5163.11	3255.61	2294.44	6646.25	1791.44	11673.73	3551.48
15	1406.38	4974.85	3083.49	2145.51	6286.25	1662.58	11062.27	3380.62
20	1360.62	4820.63	2973.54	2057.51	5960.12	1591.04	10584.52	3259.66
25	1323.95	4695.78	2890.41	1995.18	5690.10	1543.32	10182.83	3166.28
30	1281.54	4544.28	2787.55	1912.07	5398.16	1475.20	9769.19	3051.10
35	1251.88	4431.56	2724.63	1868.74	5164.40	1444.90	9470.38	2975.33
40	1224.80	4327.74	2667.07	1829.00	4949.59	1417.01	9260.32	2906.47
45	1199.90	4241.58	2616.23	1795.89	4782.36	1395.40	9081.54	2849.15
50	1177.27	4163.27	2570.13	1765.95	4633.32	1375.91	8911.36	2797.13
55	1152.45	4075.30	2517.02	1728.95	4478.52	1349.69	8722.19	2737.34
60	1129.65	3994.31	2468.11	1694.77	4334.90	1325.37	8533.29	2682.02
65	1122.17	3965.67	2455.64	1689.42	4218.61	1324.26	8389.42	2663.43
70	1114.91	3937.80	2443.63	1684.38	4111.16	1323.36	8259.28	2645.71

Appendix Table 13.1.11 Trade Account & Government Current Revenues

(In Current Mil. Rials)

	1981	1982	1983	1984	1985	1986
A) Trade Account						
Export	47.4	21.6	44.0	47.5	56.4	153.0
Import	-7867.8	-8785.7	-8082.0	-7507.2	-7973.3	-7699.5
B) Forein Trade Tax						
Customs Duties on Imports	1159.1	1301.4	1601.5	1690.0	1862.5	2182.9
Customs Duties on Exports	0.2	0.1	0.1	-	-	-

Source ; Statistical Year Book , 1986 (CPO , 1987)

Appendix Table 13.1.12 Summary of VOC (Shadow Priced Economic Cost)

(YR/1000km)

Travel Spped	Motor Cycle	Car	Taxi	Micro Bus	Medium Bus	Light Truck	Medium Truck	Average
5	1912.28	6676.55	4029.16	2776.51	8350.54	2365.42	14831.59	4524.87
10	1830.30	6440.23	3824.89	2602.62	7888.44	2210.43	14063.34	4316.16
15	1750.75	6212.28	3625.30	2431.72	7473.05	2057.70	13340.52	4114.15
20	1695.09	6024.51	3498.25	2331.84	7096.66	1972.07	12774.52	3970.57
25	1650.16	5871.45	3402.46	2261.79	6785.35	1914.36	12297.97	3859.30
30	1598.63	5687.63	3283.55	2167.32	6448.01	1832.93	11808.03	3722.68
35	1562.01	5549.16	3211.30	2119.31	6178.38	1795.68	11452.86	3632.12
40	1528.58	5421.70	3145.19	2075.25	5930.57	1761.43	11203.22	3549.83
45	1497.71	5314.91	3086.93	2038.94	5738.07	1734.51	10990.48	3481.03
50	1469.66	5217.83	3034.10	2006.10	5566.50	1710.23	10787.98	3418.58
55	1439.04	5109.48	2973.08	1965.03	5388.07	1678.09	10563.47	3347.05
60	1410.92	5009.76	2916.88	1927.05	5222.50	1648.28	10339.28	3280.89
65	1401.47	4973.84	2902.77	1921.75	5088.70	1646.32	10167.83	3258.44
70	1392.29	4938.87	2889.19	1916.79	4965.08	1644.61	10012.71	3237.02

$$SCF = OER \frac{M + X}{(M+Ti) + (X-Sx)}$$

where SCF : Standard conversion factor
OER : Official exchange rate
M : CIF value of imports
X : FOB value of exports
Ti : Duty and tax on imports
Sx : Export subsidy

By using the data on Table 13.1.11, the SCF is calculated at:

1986: 78%, 1985: 81%, 1984: 81%

SCF of 80% for YR (1.25 for foreign component) is used in this study.

- Unskilled Labor

No data are available to discuss the employment situation in urban area. Unskilled labor force is easy to find and employ. SCF of 0.5 is used for the portion using unskilled laborers.

8) Factoring

VOC elements are studied and unit cost is divided into foreign and local portions, where local portion may include part of the land transport cost after arriving at Hodeidah port. Unskilled labor is not factored because the portion is negligible.

Percent Composition in Net VOC

Item	Foreign	Local
Vehicles imported	0.95 x 1.25	0.05 x 1.00
Fuel & oil consume	0.67 x 1.25	0.33 x 1.00
Tires imported	0.95 x 1.25	0.05 x 1.00
Spare pacts	0.95 x 1.25	0.05 x 1.00
Crew cost	-	1.00 x 1.00
Overhead charge	-	x 1.00

9) Shadow Priced Economic Cost

Shadow priced economic cost is shown in Appendix Table 13.1.12 and those at selected speeds are in Table 13.2.2 of Chapter 13.

Appendix Note 13.2 Time Value of Travellers

Time value of travellers in urban area is determined by allocating the representative income scale of passenger car users and of public service vehicles on the work hours. The following are the steps of calculation:-

(1) Trip Purpose Distribution

Trip purpose distribution was found in the bus passenger survey. The percentages are shown as under, part of which values are assigned.

		..... Values are assigned on .....
To work	25.9%	43.4% x $\frac{1}{2}$ = 21.70%
To business	17.5%	
To school	13.9%	
To shopping & others	14.8%	
To go home	27.9%	27.9% x $\frac{1}{4}$ = 6.98%

(2) Occupancy Rates per Vehicle

MC	1.1	persons/Veh.
Pass, Car	2.0	(Including the driver)
Taxi	2.0	(Excluding the driver)
Micro B	3.0	(" ")
Medium B	20.0	(" ")
Other B	12.0	(Including the driver)

Study Team's survey in Sana'a.

(3) Income Levels

Income levels of vehicle users are classified into two groups in the following way:-

	Users of Passenger Cars & Taxis	Micro-medium Bus Users
-1 Income/month/person	6,000YR/m	3,000YR/m
-2 Work 25 days, 6h/day	150H/m	150H/m

		40YR/H	20YR/H
-3	Income per hour		
-4	Weight		
	-1 Work & business (21.7%)	8.68	4.34
	-2 Others 0 x (71.32)	-	-
	-3 Home ($\frac{1}{4}$ x 27.95%)	2.79	1.40
		11.47	5.74

-5 Occupants & value

(The first group of occupants with 100%, the second group with 50% and the third group with no value)

Pass.C & taxi (11.47x1.0x1.0) + (11.47x1.0x0.5) = 17.21/veh

Micro buses
(5.74x1.0) + (2.87x1.0) + (0.00x1.0) = 8.61 Y.R./veh

Medium buses
(5.74x5.0) + (2.87x5.0) + (0.00x1.00) = 43.05 Y.R./veh

(4) Determination

In using the above values for the evaluation of transport project, it is considered better to reduce the values because there remains a possibility that all saved time are not used for productive activities in the present economy in the way of life in Yemen. The values for three types of vehicles are factored by 0.5 in this economic evaluation.

Values per hour	
Passenger cars & taxis	YR17.21 x 0.5 = YR8.61/veh
Micro-buses	YR 8.61 x 0.5 = YR4.31/veh
Medium-buses	YR43.05 x 0.5 = YR21.53/veh

Appendix Table 13.2.1 Accidents in Japan

Year	Accidents (A)	Deaths (B)	Injuries (C)	Registered '000 (D)	(A)/(D) /'000	(B)/(D) /'0000	(C)/(D) /'000
1955	93981	6379	76501	1463.7	64.21	43.58	52.27
1956	122691	6751	102072	1718.9	71.38	39.28	59.38
1957	146833	7575	124530	2071.3	70.89	36.57	60.12
1958	288193	8248	185396	2331.9	123.59	35.37	79.50
1959	371763	10079	230504	2775.2	133.96	36.32	83.06
1960	449917	12055	289156	3302.1	136.25	36.51	87.57
1961	493963	12865	308697	4007.9	123.25	32.10	77.02
1962	479825	11445	313813	4748.3	101.05	24.10	66.09
1963	531966	12301	359089	5775.7	92.10	21.30	62.17
1964	557183	13318	401117	6776.0	82.23	19.65	59.20
1965	567286	12484	425666	7897.5	71.83	15.81	53.90
1966	425944	13904	517775	9339.2	45.61	14.89	55.44
1967	521481	13618	655377	11275.7	46.25	12.08	58.12
1968	635056	14256	828071	13594.9	46.71	10.49	60.91
1969	720880	16257	967000	16167.3	44.59	10.06	59.81
1970	718080	16765	981096	18586.5	38.63	9.02	52.79
1971	700290	16278	949689	20859.6	33.57	7.80	45.53
1972	659283	15918	889198	23371.8	28.21	6.81	38.05
1973	586713	14574	789948	26182.1	22.41	5.57	30.17
1974	490452	11432	651420	27710.8	17.70	4.13	23.51
1975	472938	10792	622467	28934.0	16.35	3.73	21.51
1976	471041	9734	613957	30903.1	15.24	3.15	19.87
1977	460649	8945	593211	32853.1	14.02	2.72	18.06
1978	464037	8783	594116	35000.2	13.26	2.51	16.97
1979	471573	8466	596282	37188.3	12.68	2.28	16.03
1980	476677	8760	598719	38939.0	12.24	2.25	15.38
1981	485578	8719	607346	40854.9	11.89	2.13	14.87
1982	502261	9073	626192	42768.2	11.74	2.12	14.64
1983	526362	9520	654822	44601.9	11.80	2.13	14.68
1984	518642	9262	644321	46417.0	11.17	2.00	13.88
1985	552788	9261	681346	48268.2	11.45	1.92	14.12
1986	579190	9317	712330	50276.2	11.52	1.85	14.17

Source : Traffic Annual Book
(Police Bureau, Japan 1986)

Appendix Table 13.2.2 Regression Analysis; Congestion-Velocity Curves

	Values of V/C.Hour	Velo=a*(V/C)+b a	b	No. of sample	R(%)
Arterials	All data	-35.8	55.0	36	0.79
	1.2<	-46.4	62.9	31	0.82
	1.0<	-54.0	67.8	21	0.76
Others	All data	-45.4	62.9	18	0.75
	1.2<	-54.0	68.3	17	0.75
	1.0<	-63.6	73.3	13	0.65
2 lane/ direction	All data	-26.8	43.1	12	0.84
	1.2<	-35.1	48.8	10	0.92
	1.0<	-58.2	59.7	4	0.99
3 lane/ direction	All data	-42.0	61.4	42	0.78
	1.2<	-53.0	69.2	38	0.78
	1.0<	-63.6	75.6	30	0.74
Without median	All data	-45.8	63.9	14	0.74
	1.2<	-53.2	68.5	13	0.74
	1.0<	-47.6	65.4	11	0.62
With median	All data	-37.0	55.9	40	0.79
	1.2<	-47.4	63.4	35	0.81
	1.0<	-55.9	68.6	24	0.75
data	All data	-39.9	57.9	54	0.78
	1.2<	-49.0	64.9	48	0.79
	1.0<	-57.0	69.7	34	0.72

study team

Appendix Table 13.4.1 Cost Benefit Streams

Proj. : Sana'a P- 1

COST-BENEFIT STREAMS

Year	1.000 *Cost Cost	1.000 *Ben. Ben.
1989	403.60	0.00
1990	4035.80	0.00
1991	3632.20	0.00
1992	476.20	4449.80
1993	476.20	4707.90
1994	994.50	4980.90
1995	476.20	5269.80
1996	476.20	5575.50
Total	10970.90	24983.90

B/C Ratio 2.28

B/C Ratio (11%) 1.70
P.V. (11%) 6090.29

*** Normal Calculation ***

I.R.R ..... 33.49 %
B/C Ratio (33.49%) 1.000
P.V.(IRR) 0.62

Proj. : Sana'a P- 3

COST-BENEFIT STREAMS

Year	1.000 *Cost Cost	1.000 *Ben. Ben.
1989	764.60	0.00
1990	7645.90	0.00
1991	6881.30	0.00
1992	902.20	9932.60
1993	902.20	10508.70
1994	1289.70	11118.20
1995	902.20	11763.10
1996	902.20	12445.30
Total	20190.30	55767.90

B/C Ratio 2.76

B/C Ratio (11%) 2.04
P.V. (11%) 16892.50

*** Normal Calculation ***

I.R.R ..... 41.88 %
B/C Ratio (41.88%) 1.000
P.V.(IRR) -1.02

Proj. : Sana'a P- 5

COST-BENEFIT STREAMS

Year	1.000 *Cost Cost	1.000 *Ben. Ben.
1989	821.90	0.00
1990	8219.40	0.00
1991	7397.40	0.00
1992	969.90	6859.30
1993	969.90	7257.10
1994	1773.40	7678.10
1995	969.90	8123.40
1996	969.90	8594.50
Total	22091.70	38512.40

B/C Ratio 1.74

B/C Ratio (11%) 1.30
P.V. (11%) 5218.35

*** Normal Calculation ***

I.R.R ..... 21.43 %
B/C Ratio (21.43%) 1.000
P.V.(IRR) -0.27

Proj. : Sana'a P- 7

COST-BENEFIT STREAMS

Year	1.000 *Cost Cost	1.000 *Ben. Ben.
1989	1340.90	0.00
1990	13408.90	0.00
1991	12068.00	0.00
1992	1582.20	13321.40
1993	1582.20	14094.00
1994	2472.20	14911.50
1995	1582.20	15776.40
1996	1582.20	16691.40
Total	35618.80	74794.70

B/C Ratio 2.10

B/C Ratio (11%) 1.56
P.V. (11%) 15858.30

*** Normal Calculation ***

I.R.R ..... 29.21 %
B/C Ratio (29.21%) 1.000
P.V.(IRR) 0.87

Proj. : Sana'a P- 2

COST-BENEFIT STREAMS

Year	1.000 *Cost Cost	1.000 *Ben. Ben.
1989	1170.60	0.00
1990	11705.90	0.00
1991	10535.30	0.00
1992	1381.30	10481.60
1993	1381.30	11089.50
1994	2320.20	11732.70
1995	1381.30	12413.20
1996	1381.30	13133.20
Total	31257.20	58850.20

B/C Ratio 1.88

B/C Ratio (11%) 1.40
P.V. (11%) 9926.38

*** Normal Calculation ***

I.R.R ..... 24.56 %
B/C Ratio (24.56%) 1.000
P.V.(IRR) 2.19

Proj. : Sana'a P- 4

COST-BENEFIT STREAMS

Year	1.000 *Cost Cost	1.000 *Ben. Ben.
1989	411.30	0.00
1990	4112.60	0.00
1991	3701.30	0.00
1992	485.30	3678.30
1993	485.30	3891.60
1994	791.30	4117.40
1995	485.30	4356.20
1996	485.30	4608.80
Total	10957.70	20652.30

B/C Ratio 1.88

B/C Ratio (11%) 1.40
P.V. (11%) 3487.67

*** Normal Calculation ***

I.R.R ..... 24.56 %
B/C Ratio (24.56%) 1.000
P.V.(IRR) 0.71

Proj. : Sana'a P- 6

COST-BENEFIT STREAMS

Year	1.000 *Cost Cost	1.000 *Ben. Ben.
1989	1181.00	0.00
1990	11810.40	0.00
1991	10629.40	0.00
1992	1393.60	15850.50
1993	1393.60	16769.80
1994	2290.50	17742.50
1995	1393.60	18771.50
1996	1393.60	19860.30
Total	31485.70	88994.60

B/C Ratio 2.83

B/C Ratio (11%) 2.10
P.V. (11%) 27607.10

*** Normal Calculation ***

I.R.R ..... 43.34 %
B/C Ratio (43.34%) 1.000
P.V.(IRR) -0.32

Proj. : Sana'a P- 8

COST-BENEFIT STREAMS

Year	1.000 *Cost Cost	1.000 *Ben. Ben.
1989	896.40	0.00
1990	8964.20	0.00
1991	8067.70	0.00
1992	1057.80	7678.60
1993	1057.80	8124.00
1994	1484.30	8595.10
1995	1057.80	9093.70
1996	1057.80	9621.10
Total	23643.80	43112.50

B/C Ratio 1.82

B/C Ratio (11%) 1.35
P.V. (11%) 6616.44

*** Normal Calculation ***

I.R.R ..... 22.96 %
B/C Ratio (22.96%) 1.000
P.V.(IRR) -0.15

Appendix Table 13.4.1 Cost Benefit Streams

Proj. : Sana'a P- 9

COST-BENEFIT STREAMS

Year	1.000 *Cost Cost	1.000 *Ben. Ben.
1989	515.00	0.00
1990	5149.70	0.00
1991	4634.70	0.00
1992	607.70	4763.10
1993	607.70	5039.40
1994	985.00	5331.60
1995	607.70	5640.90
1996	607.70	5968.00
Total	13715.20	26743.00

B/C Ratio 1.95

B/C Ratio (11%) 1.45
P.V. (11%) 4893.98

*** Normal Calculation ***

I.R.R ..... 26.02 %
B/C Ratio (26.02%) 1.000
P.V.(IRR) -0.14

Proj. : Sana'a P-11

COST-BENEFIT STREAMS

Year	1.000 *Cost Cost	1.000 *Ben. Ben.
1989	484.70	0.00
1990	4847.40	0.00
1991	4362.60	0.00
1992	572.00	3377.30
1993	572.00	3573.20
1994	684.10	3780.40
1995	572.00	3999.70
1996	572.00	4231.70
Total	12666.80	18962.30

B/C Ratio 1.50

B/C Ratio (11%) 1.11
P.V. (11%) 1068.50

*** Normal Calculation ***

I.R.R ..... 14.83 %
B/C Ratio (14.83%) 1.000
P.V.(IRR) 0.31

Proj. : Sana'a P-13

COST-BENEFIT STREAMS

Year	1.000 *Cost Cost	1.000 *Ben. Ben.
1989	196.00	0.00
1990	1959.70	0.00
1991	1763.70	0.00
1992	231.20	2834.90
1993	231.20	2999.30
1994	781.70	3173.30
1995	231.20	3357.30
1996	231.20	3552.10
Total	5625.90	15916.90

B/C Ratio 2.83

B/C Ratio (11%) 2.14
P.V. (11%) 5024.46

*** Normal Calculation ***

I.R.R ..... 45.97 %
B/C Ratio (45.97%) 1.000
P.V.(IRR) -0.20

Proj. : P-1,2,4,7

COST-BENEFIT STREAMS

Year	1.000 *Cost Cost	1.000 *Ben. Ben.
1989	3.30	0.00
1990	33.30	0.00
1991	29.90	0.00
1992	3.90	31.90
1993	3.90	33.80
1994	6.55	35.70
1995	3.90	37.80
1996	3.90	40.00
Total	88.65	179.20

B/C Ratio 2.02

B/C Ratio (11%) 1.50
P.V. (11%) 35.41

*** Normal Calculation ***

I.R.R ..... 27.62 %
B/C Ratio (27.62%) 1.000
P.V.(IRR) -0.00

Proj. : Sana'a P-10

COST-BENEFIT STREAMS

Year	1.000 *Cost Cost	1.000 *Ben. Ben.
1989	709.80	0.00
1990	7098.20	0.00
1991	6388.30	0.00
1992	837.60	9161.50
1993	837.60	9692.90
1994	1333.10	10255.10
1995	837.60	10849.80
1996	837.60	11479.10
Total	18879.80	51438.40

B/C Ratio 2.72

B/C Ratio (11%) 2.02
P.V. (11%) 15403.40

*** Normal Calculation ***

I.R.R ..... 41.44 %
B/C Ratio (41.44%) 1.000
P.V.(IRR) -0.79

Proj. : Sana'a P-12

COST-BENEFIT STREAMS

Year	1.000 *Cost Cost	1.000 *Ben. Ben.
1989	557.40	0.00
1990	5573.90	0.00
1991	5016.50	0.00
1992	657.70	7130.80
1993	657.70	7544.40
1994	1163.80	7982.00
1995	657.70	8444.90
1996	657.70	8934.70
Total	14942.40	40036.80

B/C Ratio 2.68

B/C Ratio (11%) 1.99
P.V. (11%) 11815.40

*** Normal Calculation ***

I.R.R ..... 40.87 %
B/C Ratio (40.87%) 1.000
P.V.(IRR) -0.33

Proj. : Sana'a P-14

COST-BENEFIT STREAMS

Year	1.000 *Cost Cost	1.000 *Ben. Ben.
1989	684.60	0.00
1990	6846.10	0.00
1991	6161.40	0.00
1992	807.80	8352.20
1993	807.80	8836.60
1994	1412.50	9349.20
1995	807.80	9891.40
1996	807.80	10465.10
Total	18335.80	46894.50

B/C Ratio 2.56

B/C Ratio (11%) 1.90
P.V. (11%) 13170.30

*** Normal Calculation ***

I.R.R ..... 38.57 %
B/C Ratio (38.57%) 1.000
P.V.(IRR) -0.06

Proj. : P-5,10

COST-BENEFIT STREAMS

Year	1.000 *Cost Cost	1.000 *Ben. Ben.
1989	1.50	0.00
1990	15.30	0.00
1991	13.80	0.00
1992	1.80	16.00
1993	1.80	15.90
1994	3.10	17.90
1995	1.80	18.90
1996	1.80	20.00
Total	40.90	89.70

B/C Ratio 2.19

B/C Ratio (11%) 1.63
P.V. (11%) 20.54

*** Normal Calculation ***

I.R.R ..... 31.36 %
B/C Ratio (31.36%) 1.000
P.V.(IRR) 0.00

Appendix Table 13.4.1 Cost Benefit Streams

Proj. : P-13,14

COST-BENEFIT STREAMS

Year	1.000 *Cost Cost	1.000 *Ben. Ben.
1989	0.90	0.00
1990	8.80	0.00
1991	7.90	0.00
1992	1.00	11.20
1993	1.00	11.80
1994	2.15	12.50
1995	1.00	13.30
1996	1.00	14.00
Total	23.75	62.80

B/C Ratio 2.64

B/C Ratio (11%) 1.97
P.V. (11%) 18.31

*** Normal Calculation ***

I.R.R ..... 40.41 %
B/C Ratio (40.41%) 1.000
P.V.(IRR) -0.00

Proj. : San'a Total

COST-BENEFIT STREAMS

Year	1.000 *Cost Cost	1.000 *Ben. Ben.
1989	10.10	0.00
1990	101.40	0.00
1991	91.30	0.00
1992	12.00	107.90
1993	12.00	114.20
1994	19.81	120.80
1995	12.00	127.80
1996	12.00	135.20
Total	270.61	605.90

B/C Ratio 2.24

B/C Ratio (11%) 1.66
P.V. (11%) 143.08

*** Normal Calculation ***

I.R.R ..... 32.22 %
B/C Ratio (32.22%) 1.000
P.V.(IRR) 0.02

Proj. : Hodeida P-15

COST-BENEFIT STREAMS

Year	1.000 *Cost Cost	1.000 *Ben. Ben.
1989	603.90	0.00
1990	6038.70	0.00
1991	5434.80	0.00
1992	712.60	5645.40
1993	712.60	5984.10
1994	1831.20	6343.20
1995	712.60	6723.80
1996	712.60	7127.20
Total	16759.00	31823.70

B/C Ratio 1.90

B/C Ratio (11%) 1.42
P.V. (11%) 5605.28

*** Normal Calculation ***

I.R.R ..... 25.71 %
B/C Ratio (25.71%) 1.000
P.V.(IRR) 0.49

Proj. : P-Other

COST-BENEFIT STREAMS

Year	1.000 *Cost Cost	1.000 *Ben. Ben.
1989	4.40	0.00
1990	44.00	0.00
1991	39.60	0.00
1992	5.20	48.70
1993	5.20	51.50
1994	7.91	54.50
1995	5.20	57.70
1996	5.20	61.00
Total	116.71	273.40

B/C Ratio 2.34

B/C Ratio (11%) 1.74
P.V. (11%) 68.72

*** Normal Calculation ***

I.R.R ..... 34.14 %
B/C Ratio (34.14%) 1.000
P.V.(IRR) -0.01

Proj. : Taiz P-15

COST-BENEFIT STREAMS

Year	1.000 *Cost Cost	1.000 *Ben. Ben.
1989	819.50	0.00
1990	8194.70	0.00
1991	7375.20	0.00
1992	967.00	8996.30
1993	967.00	9536.10
1994	1959.10	10108.20
1995	967.00	10714.70
1996	967.00	11357.60
Total	22216.50	50712.90

B/C Ratio 2.28

B/C Ratio (11%) 1.70
P.V. (11%) 12380.00

*** Normal Calculation ***

I.R.R ..... 33.48 %
B/C Ratio (33.48%) 1.000
P.V.(IRR) 0.43

Proj. : Total

COST-BENEFIT STREAMS

Year	1.000 *Cost Cost	1.000 *Ben. Ben.
1989	11.60	0.00
1990	115.60	0.00
1991	104.00	0.00
1992	13.60	122.50
1993	13.60	129.60
1994	23.52	137.10
1995	13.60	145.10
1996	13.60	153.50
Total	309.12	687.80

B/C Ratio 2.23

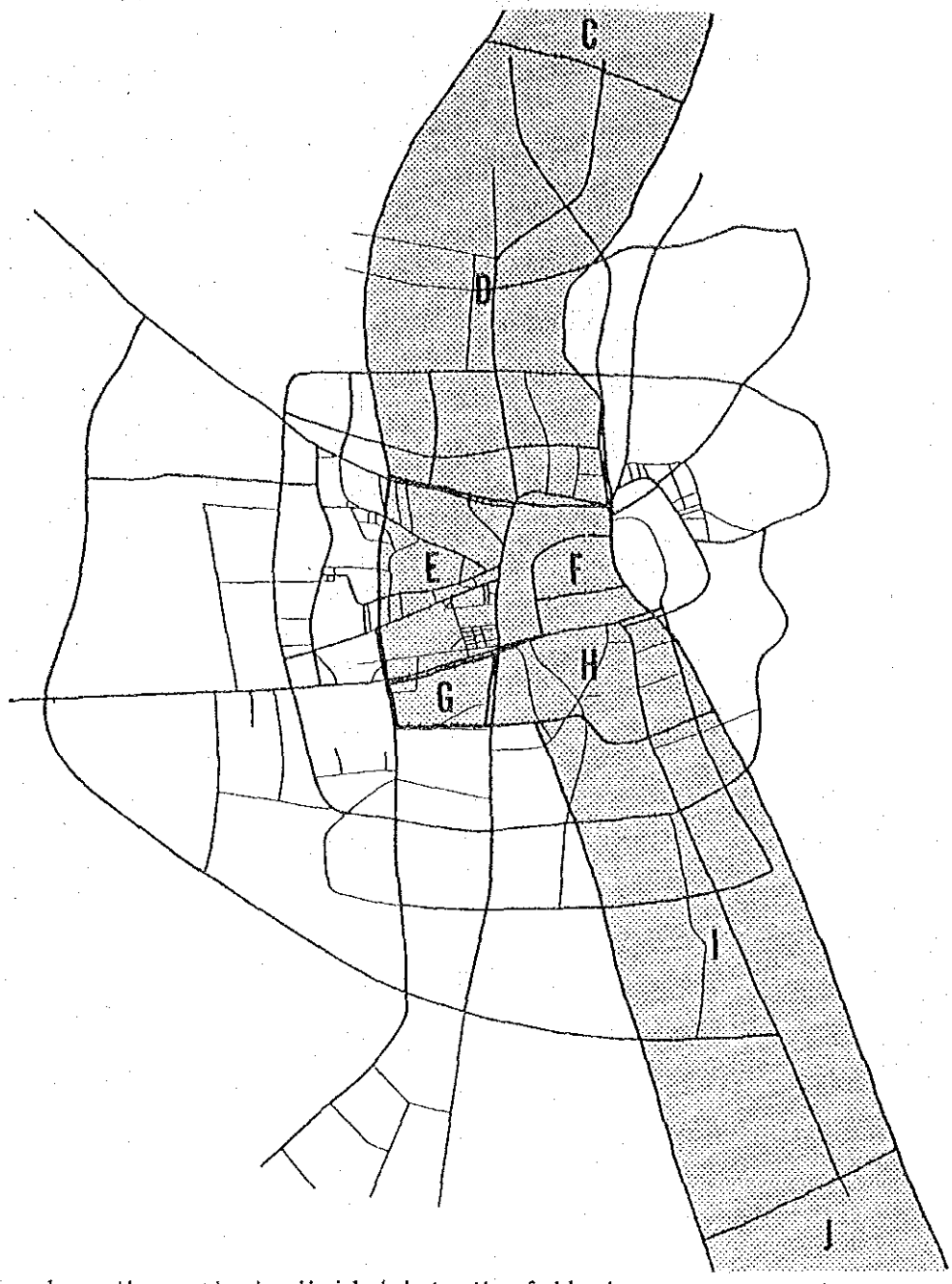
B/C Ratio (11%) 1.65
P.V. (11%) 160.98

*** Normal Calculation ***

I.R.R ..... 31.98 %
B/C Ratio (31.98%) 1.000
P.V.(IRR) 0.01

APPENDIX TO CHAPTER 14

Appendix Fig. 14.4.1 Zoning for Demand Analysis



Areas along the route is divided into the following zones to analyze the traffic demand.

Zone A = North of Rawdah area
Zone B = Rawdah area
Zone C = Jiraf area
Zone D = Between Tahrir area and Jiraf area
Zone E = Tahrir area
Zone F = Old City Center area
Zone G = South/West of Officer's Club area
Zone H = Bab Al Yemen area
Zone I = Taiz Road area between Bab Al Yemen and Qat Market
Zone J = Taiz Road area South of Qat Market

Appendix Table 14.4.1 Bus/Taxi Passenger OD Table by Mode

O#	D#[2]	MiB	MeB	Tax	Sin	Dou	Tri	Tot [1]	%
A	A	0	0	0	0	0	57	57	0.04
	D	0	120	57	177	272	177	626	0.42
	E	0	0	114	114	409	314	837	0.56
	F	0	0	0	0	57	0	57	0.04
	H	0	86	0	86	62	57	205	0.14
	K	0	0	0	0	187	57	244	0.16
	L	0	0	0	0	101	57	158	0.11
	P	0	62	124	186	272	0	458	0.31
	Q	0	0	0	0	0	57	57	0.04
	X	0	0	0	0	88	86	174	0.12
	Tot	0	268	295	563	1448	862	2873	1.94
B	B	0	0	0	0	0	57	57	0.04
	D	0	0	0	0	234	0	234	0.16
	E	0	0	86	86	176	0	262	0.18
	H	0	0	0	0	62	0	62	0.04
	I	0	0	0	0	144	0	144	0.10
	K	57	0	0	57	189	0	246	0.17
	M	0	0	0	0	217	0	217	0.15
	N	0	0	0	0	57	0	57	0.04
	P	0	0	0	0	62	86	148	0.10
	X	0	0	0	0	101	0	101	0.07
	Tot	57	0	86	143	1242	143	1528	1.03
C	D	240	0	0	240	388	120	748	0.50
	E	57	0	0	57	386	0	443	0.30
	H	0	0	0	0	86	62	148	0.10
	I	0	0	0	0	62	0	62	0.04
	K	0	0	0	0	0	114	114	0.08
	L	0	0	0	0	101	0	101	0.07
	P	0	0	0	0	162	62	224	0.15
	X	0	0	57	57	341	0	398	0.27
	Tot	297	0	57	354	1526	358	2238	1.51
D	D	1048	240	57	1345	643	340	2328	1.57
	E	1948	210	1047	3205	2397	148	5750	3.88
	F	0	0	0	0	0	62	62	0.04
	H	177	1004	371	1552	1334	444	3330	2.25
	I	381	0	0	381	1530	572	2483	1.67
	J	57	0	0	57	167	167	391	0.26
	K	706	374	398	1478	1126	207	2811	1.90
	L	375	0	0	375	410	0	785	0.53
	M	86	0	0	86	62	0	148	0.10
	N	364	120	150	634	731	86	1451	0.98
	O	0	0	0	0	0	187	187	0.13
	P	62	248	0	310	354	62	726	0.49
	Q	44	0	120	164	120	0	284	0.19
	X	935	0	79	1014	1606	540	3160	2.13
	Tot	6183	2196	2222	10601	10480	2815	23896	16.12
E	E	404	0	86	490	268	86	844	0.57
	F	0	62	0	62	248	0	310	0.21
	G	288	0	0	288	0	0	288	0.19
	H	258	1201	86	1545	2292	527	4364	2.94
	I	769	385	86	1240	4859	986	7085	4.78
	J	0	0	86	86	0	100	186	0.13
	K	666	2054	285	3005	1481	388	4874	3.29
	L	520	86	116	722	303	0	1025	0.69
	M	490	0	0	490	101	0	591	0.40
	N	1524	0	172	1696	670	387	2753	1.86

Appendix Table 14.4.1 Bus/Taxi Passenger OD Table by Mode (continued)

O#	D#2)	MiB	MeB	Tax	Sin	Dou	Tri	Tot	1) %
E	O	74	0	0	74	296	75	445	0.30
	P	248	1942	272	2462	816	186	3464	2.34
	Q	0	0	0	0	148	62	210	0.14
	X	646	269	468	1382	2300	490	1172	2.81
	Tot	5886	5999	1657	13542	13782	3287	30611	20.65
F	H	100	0	0	100	0	0	100	0.07
	I	200	434	0	634	200	0	834	0.56
	J	100	0	0	100	0	0	100	0.07
	K	0	0	0	0	86	62	148	0.10
	L	201	0	0	201	0	0	201	0.14
	M	101	0	0	101	100	101	302	0.20
	N	100	0	0	100	0	0	100	0.07
	Q	0	0	0	0	62	0	62	0.04
	X	300	0	0	300	200	0	500	0.34
	Tot	1102	434	0	1536	648	163	2347	1.58
G	H	0	0	0	0	100	0	100	0.07
	I	0	0	0	0	167	0	167	0.11
	O	74	0	0	74	74	0	148	0.10
	P	0	0	0	0	124	0	124	0.08
	Tot	74	0	0	74	465	0	539	0.36
H	H	100	0	0	100	100	186	386	0.26
	I	3449	2187	400	6036	11079	1207	18322	12.36
	J	400	167	0	567	434	934	1935	1.31
	K	1569	1479	0	3048	1924	745	5717	3.86
	L	516	0	0	516	516	301	1333	0.90
	M	303	0	0	303	0	100	403	0.27
	N	744	0	191	935	1066	116	2117	1.43
	O	303	0	0	303	443	202	948	0.64
	P	124	0	0	124	358	0	482	0.33
	Q	0	0	0	0	0	62	62	0.04
	X	600	216	0	816	2058	1699	4573	3.08
	Tot	8108	4049	591	12748	17978	5552	36278	24.47
I	I	1781	963	0	2744	1110	295	4149	2.80
	J	0	0	0	0	167	0	167	0.11
	K	1495	0	0	1495	3103	300	4898	3.30
	L	300	0	0	300	995	568	1863	1.26
	M	295	295	0	590	483	101	1174	0.79
	N	2620	0	295	2915	946	0	3861	2.60
	O	241	167	0	408	536	0	944	0.64
	P	100	62	62	224	329	0	553	0.37
	X	300	167	295	762	3577	811	5150	3.47
	Tot	7132	1654	652	9438	11246	2075	22759	15.35
J	J	0	0	0	0	295	0	295	0.20
	L	0	0	0	0	100	0	100	0.07
	N	0	0	0	0	0	100	100	0.07
	O	74	0	0	74	100	167	341	0.23
	X	0	0	0	0	200	219	419	0.28
	Tot	74	0	0	74	695	486	1255	0.85
K	K	290	0	785	1075	288	0	1363	0.92
	L	1434	0	264	1698	521	0	2219	1.50
	M	303	0	0	303	202	0	505	0.34
	N	1625	0	176	1801	1121	101	3023	2.04
	O	377	0	0	377	148	0	525	0.35
	P	162	148	0	310	721	148	1179	0.80
	X	2917	285	745	3947	1114	201	5262	3.55
	Tot	7108	433	1970	9511	4115	450	14076	9.50

Appendix Table 14.4.1 Bus/Taxi Passenger OD Table by Mode (continued)

O#	D#2)	MiB	MeB	Tax	Sin	Dou	Tri	Tot 1)	%
L	L	88	0	0	88	0	101	189	0.13
	M	303	0	101	404	0	101	505	0.34
	N	404	0	150	554	318	0	872	0.59
	O	0	0	0	0	425	0	425	0.29
	P	0	0	0	0	362	0	362	0.24
	X	145	0	0	145	658	44	847	0.57
	Tot	940	0	251	1191	1763	246	3200	2.16
M	M	0	0	0	0	116	0	116	0.08
	N	75	0	0	75	0	0	75	0.05
	O	296	0	0	296	249	0	545	0.37
	P	0	0	0	0	0	86	86	0.06
	X	101	0	0	101	172	0	273	0.18
	Tot	472	0	0	472	537	86	1095	0.74
N	N	75	0	0	75	0	0	75	0.05
	O	299	0	0	299	223	0	522	0.35
	P	44	0	62	106	202	0	308	0.21
	X	675	75	0	750	322	116	1188	0.80
	Tot	1093	75	62	1230	747	116	2093	1.41
O	O	74	0	0	74	74	0	148	0.10
	P	0	0	0	0	0	62	62	0.04
	Q	0	0	0	0	44	0	44	0.03
	X	323	0	0	323	276	202	801	0.54
	Tot	397	0	0	397	394	264	1055	0.71
P	P	186	62	0	248	0	86	334	0.23
	X	44	124	97	265	669	86	1020	0.69
	Tot	230	186	97	513	669	172	1354	0.91
Q	X	62	0	0	62	44	62	168	0.11
	Tot	62	0	0	62	44	62	168	0.11
X	X	0	0	70	70	642	168	880	0.59
	Tot	0	0	70	70	642	168	880	0.59
Tot	Tot	39215	15294	8010	62519	68421	17305	148245	100.00

Notes: 1) MiB: Micro Buses
MeB: Medium Buses
Tax: Taxis
Sin: Single rides in the total of MiB + MeB + Tax
Dou: Double rides
Tri: Triple rides

2) Both directions
Source: Study Team

Appendix Note 14.4.1 Methodology for Estimation of New Bus Passengers

The number of new bus passengers is estimated by using the public transport passenger survey results.

(1) Potential new bus passengers taken from double and triple rides at present

$$= \Sigma \text{ (Estimated two-way person trips of double and triple rides)} \times \frac{\text{New bus freq. x 5 minutes}}{16 \text{ hours}} + \Sigma' \{\text{Estimated two-way person trips of double and triple rides}\} \times \frac{\text{New bus freq. x 5 minutes}}{16 \text{ hours}} \times 0.5$$

where

- Σ means all OD pair person trips in ( ) along the new bus route are added.
- Σ' means all OD pair person trips in [ ] beyond the new bus route are added.
- Person trips with origin or destination beyond the new bus route are assumed to generate new bus passengers with origin or destination at the corresponding end of the new bus route.
- Person trips of single rides in medium buses, micro buses and taxis are assumed not to be transferred to the new bus service.
- The wait time of 5 minutes is for YR2 fare case. For YR3 fare case, the wait time is assumed to be 2/3 of 5 minutes or 3.3 minutes.

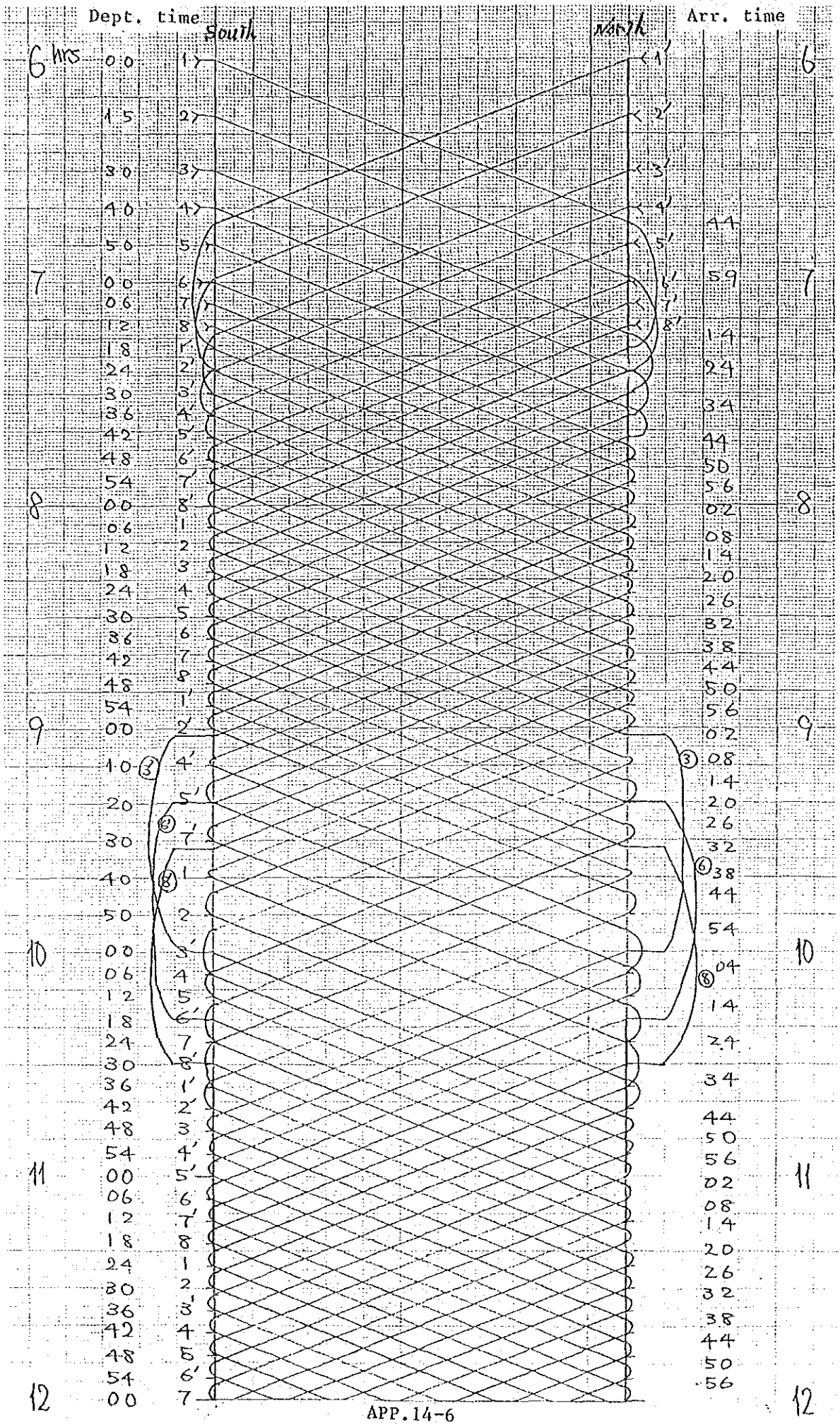
(2) New bus passengers in future

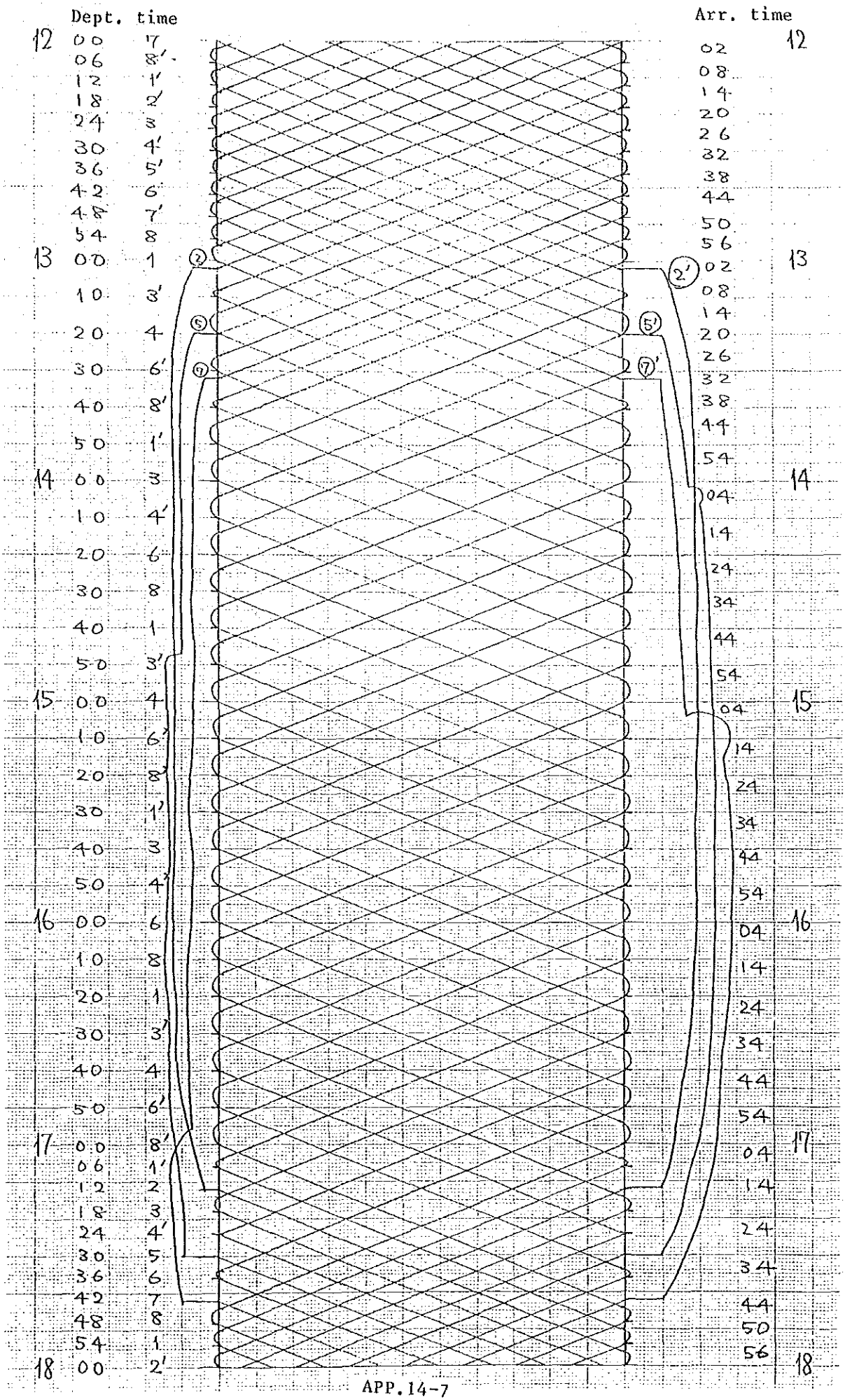
= Potential new bus passengers x Growth rate

where the growth rate is forecast at 10% p.a. between 1987 to 1991, and 7% p.a. from 1991.

(3) Numbers of passengers by section is estimated by adding the relevant OD pairs passing through the sections. The maximum number is set at 80% of the capacity with which revenue is also estimated.

Appendix Fig. 14.4.2 An Example of an Operation Diagram




Dept. time
Arr. time
12 00 7
06 8'
12 1'
18 2'
24 3
30 4'
36 5'
42 6'
48 7'
54 8
13 00 1
10 3'
20 4
30 6'
40 8'
50 1'
14 00 3
10 4'
20 6
30 8
40 1
50 3'
15 00 4
10 6'
20 8'
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40 3
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16 00 6
10 8
20 1
30 3'
40 4
50 6'
17 00 8'
06 1'
12 2
18 3
24 4'
30 5
36 6
42 7
48 8
54 1
18 00 2'
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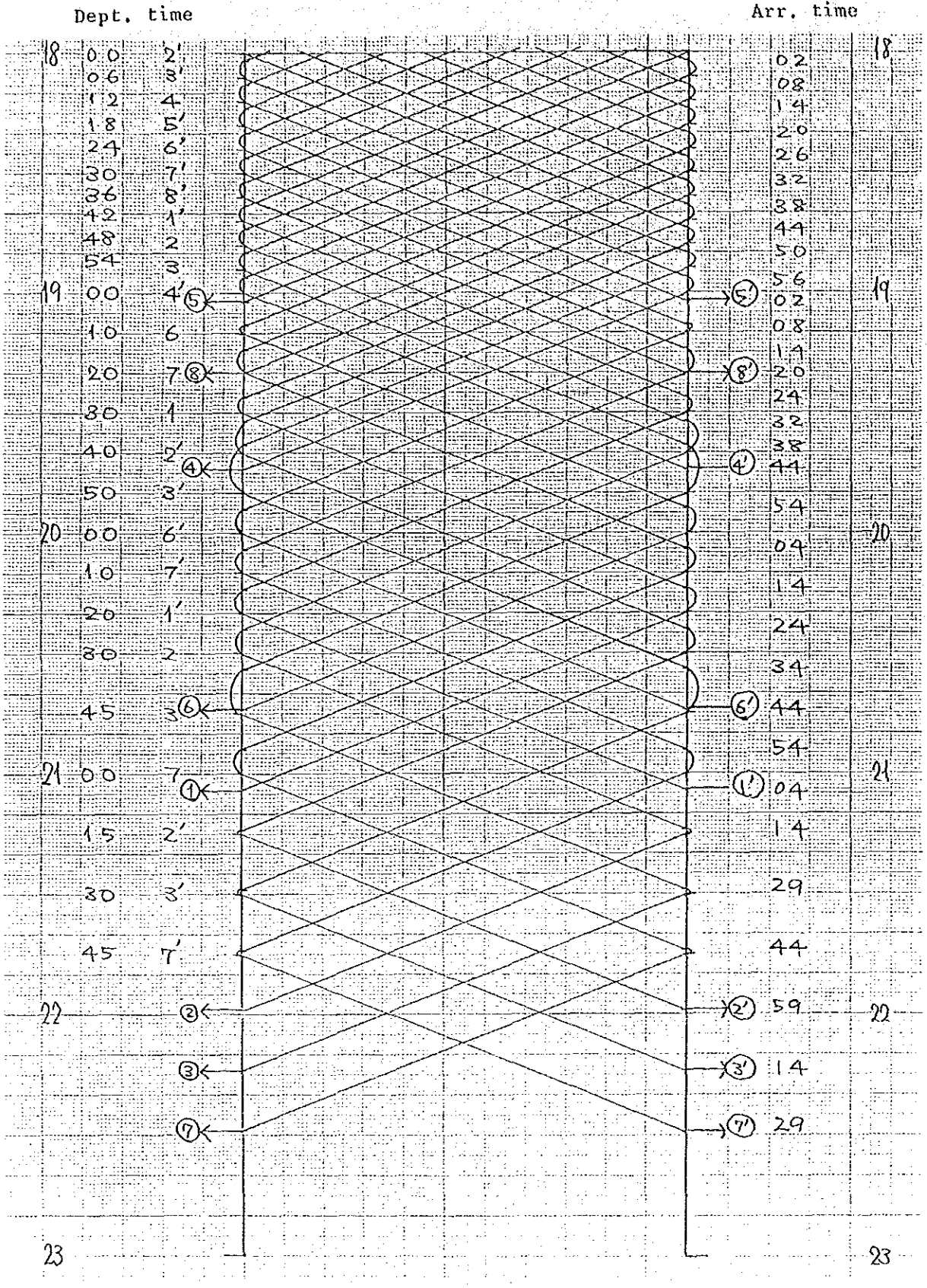
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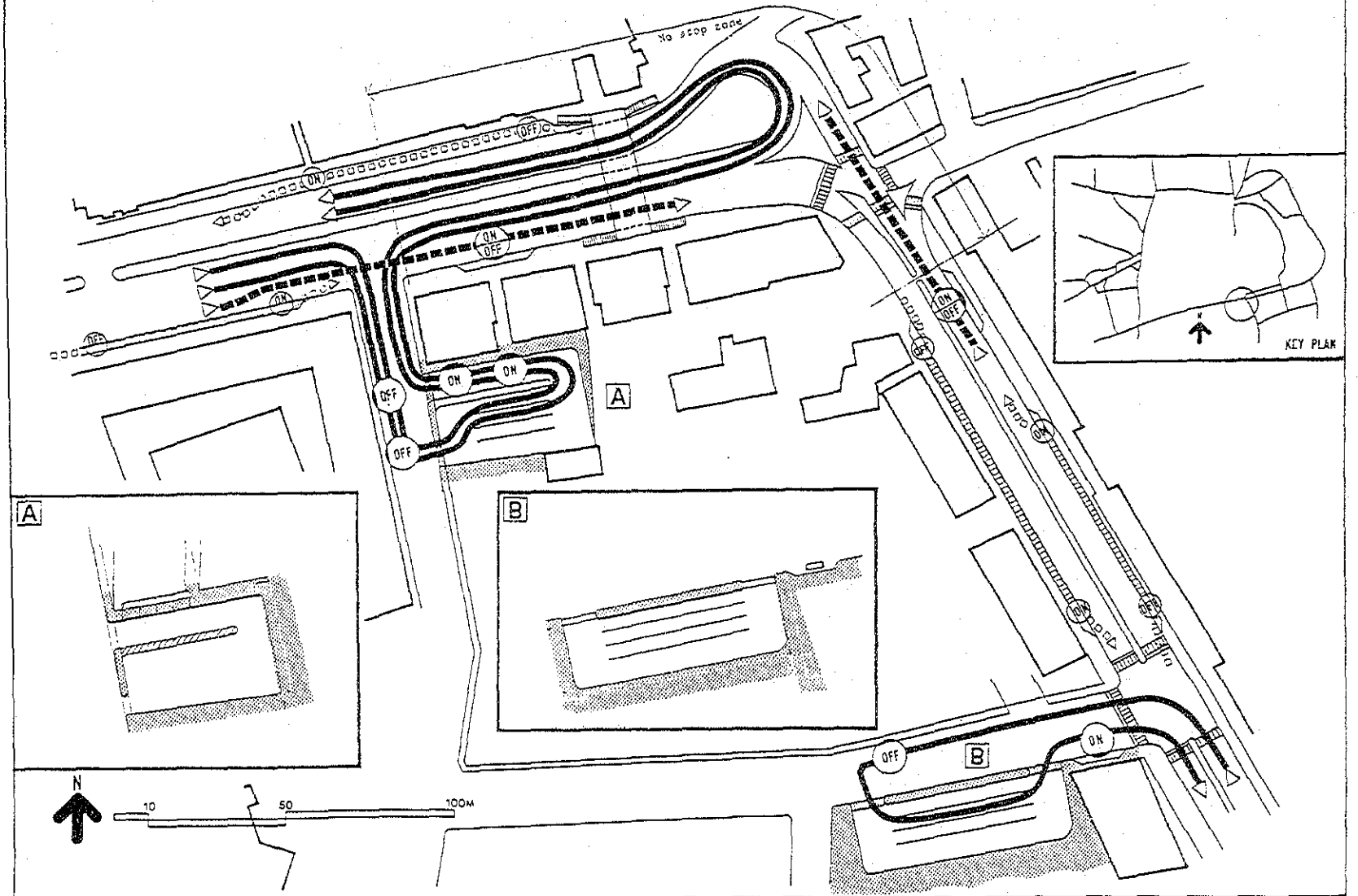
Appendix Table 14.4.2 Personnel Expenses

Item	Cost (YR)	Calculations
General Director	108,000	YR 9000 x 12
Secretary	42,000	YR 35000 x 12
Subtotal	150,000	YR 12500 x 12
Administration Director	84,000	YR 7000 x 12
General affairs staff	66,000	YR 5500 x 12
Personnel staff	66,000	YR 5500 x 12
Planning/study staff	66,000	YR 5500 x 12
Finance staff	66,000	YR 5500 x 12
Accountants	171,000	(YR 5500 + YR 4750 + YR 4000) x 12
Safety/accident staff	57,000	YR 4750 x 12
Subtotal	576,000	YR 48000 x 12
Operation director	84,000	YR 7000 x 12
Operation staff	171,000	(YR 5500 + YR 4750 + YR 4000) x 12
Dispatchers	171,000	(YR 5500 + YR 4750 + YR 4000) x 12
Drivers	1,920,000	YR 4000 x 40 x 12
Conductors	1,680,000	YR 3500 x 40 x 12
Subtotal	4,026,000	YR 335,500 x 12
Technical director	84,000	YR 7000 x 12
Foreman	66,000	YR 5500 x 12
Mechanics	228,000	YR 4750 x 4 x 12
Assistant mechanics	192,000	YR 4000 x 4 x 12
Store keeper	48,000	YR 4000 x 12
Watchmen	72,000	YR 3000 x 2 x 12
Subtotal	690,000	YR 57,500 x 12
Total	5,442,000	YR 453,500 x 12
Actual cost	6,258,300	Total x 1.15 (Gross cost)

Appendix Table 14.4.3 Repair and Maintenance Costs

Item	Cost (YR)	Calculations
Oil	57,800	YR 35.1 x 14.5 ℓ x $\frac{908,000 \text{ km}}{8,000 \text{ km}}$
Tires	424,900	YR 3900 x 6 tires x $\frac{908,000 \text{ km}}{50,000 \text{ km}}$
Spare parts		
1st year	212,160	YR 13260 x 16 operating vehicles
2nd year	315,500	YR 19718 x 16 operating vehicles
3rd year	418,800	YR 26177 x 16 operating vehicles
4th year	522,200	YR 32635 x 16 operating vehicles
5th year	625,500	YR 39094 x 16 operating vehicles
6th year	728,800	YR 45552 x 16 operating vehicles
7th year	832,200	YR 52010 x 16 operating vehicles
8th year	935,500	YR 58469 x 16 operating vehicles
Batteries	59,000	YR 1560 x $\frac{908,000 \text{ km}}{24,000 \text{ km}}$

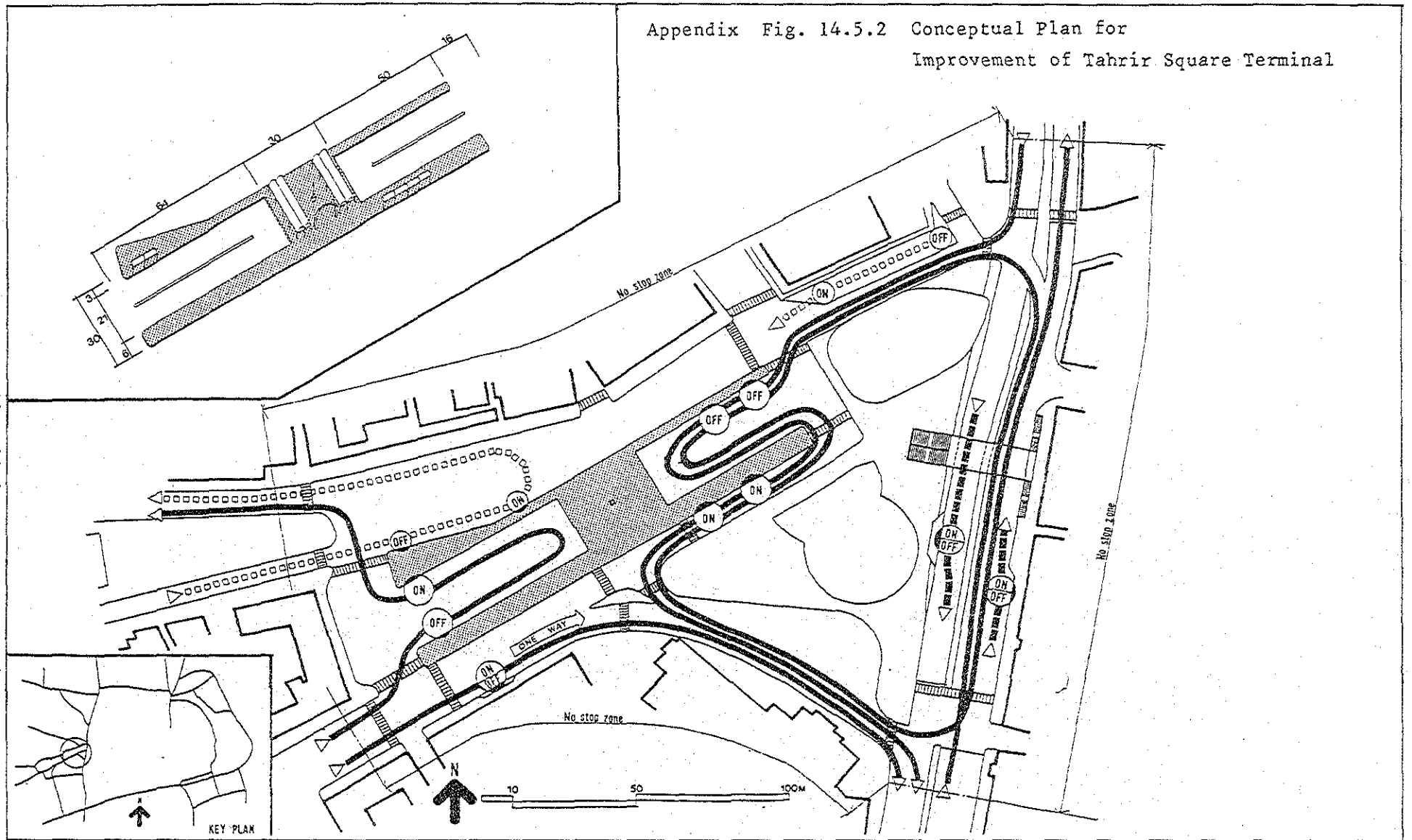
Appendix Fig. 14.5.1 Conceptual Plan for Improvement of Bab Al Yemen Terminal



- Facilities = 2 large bus stops + 2 medium bus terminals + 4 micro bus/taxi stops
- Total area of bays/terminals = Approximately 3900 m^2
- Estimated total cost = Approximately YR5,560,000

Large bus route
Medium bus route
Micro bus route / taxi route

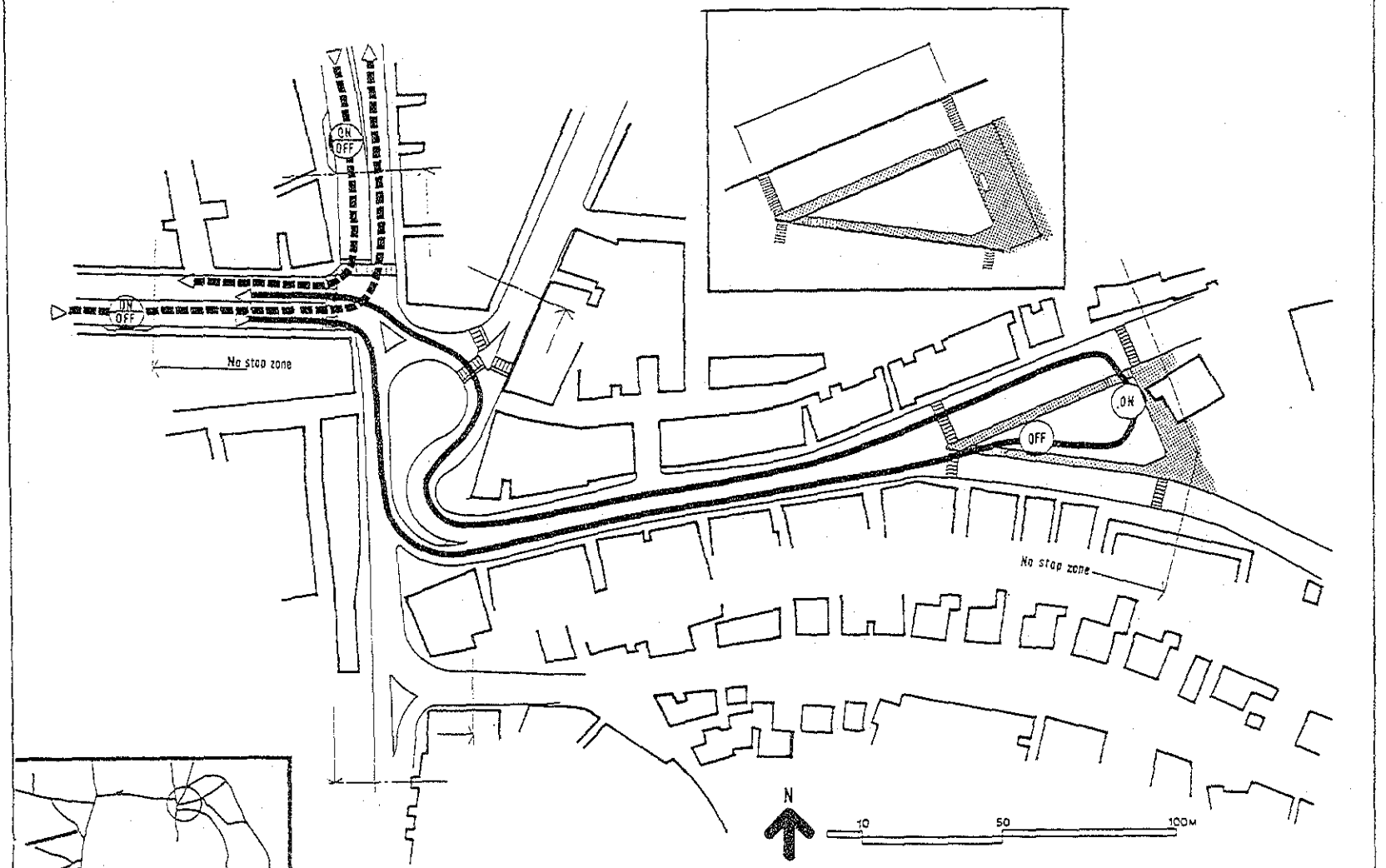
Appendix Fig. 14.5.2 Conceptual Plan for
Improvement of Tahrir Square Terminal



- Facilities = 2 large bus stops + 1 medium bus terminal + 1 medium bus stop +2 microbus/taxi stops
- Total area of bays/terminals = Approximately 5600 m^2
- Estimated total cost = Approximately YR7,450,000

Large bus route
Medium bus route
Micro bus route / taxi route

Appendix Fig. 14.5.3 Conceptual Plan for Improvement of Bab Shuub Terminal



- Facilities = 2 large bus stops + 1 medium bus terminal
- Total area of bays/terminals = Approximately 1200 m^2
- Estimated total cost = Approximately YR2,030,000

Large bus route
Medium bus route