

### 3.8 COST ESTIMATION

Project cost of three types of surveillance system: Manual, Camera, and ERP system, for each alternative of the TDM area are prepared in Table 3.8.1. The estimated revenues by alternative TDM area are also shown in Table 3.8.2. Details of cost estimation of each surveillance system are described in the subsequent subsections.

**Table 3.8.1 Comparisons of Project Cost**

[Unit: Rp. billion]

Method		TDM Area Alternative					
		ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6
Manual system	Investment	65.6	69.3	88.1	91.8	90.6	109.4
	Annual OM	18.2	19.9	27.6	29.3	31.1	37.5
Camera system	Investment	203.4	209.5	245.2	251.3	245.3	278.7
	Annual OM	15.8	17.3	19.0	19.3	19.1	20.6
ERP system	Investment	444.3	463.9	581.0	600.7	577.3	686.1
	Annual OM	24.3	25.2	29.5	30.4	29.6	33.9

Source: SITRAMP Estimate

**Table 3.8.2 Estimated Annual Revenue**

[Unit: Rp. billion]

Annual Revenue		ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6
2007	Case 1 (=Rp. 4,000)	360	440	680	760	1,010	1,160
	Case 2 (=Rp. 8,000)	690	830	1,280	1,430	1,880	2,170
	Case 3 (=Rp.12,000)	960	1,170	1,760	1,980	2,590	3,010
	Case 4 (=Rp.16,000)	1,180	1,430	2,130	2,390	3,110	3,640
	Case 5 (=Rp.20,000)	1,330	1,620	2,370	2,670	3,440	4,070
2020	Case 1 (=Rp. 4,000)	550	670	1,060	1,190	1,590	1,790
	Case 2 (=Rp. 8,000)	1,060	1,310	2,050	2,300	3,070	3,460
	Case 3 (=Rp.12,000)	1,530	1,880	2,940	3,290	4,400	4,960
	Case 4 (=Rp.16,000)	1,930	2,380	3,700	4,140	5,540	6,250
	Case 5 (=Rp.20,000)	2,270	2,800	4,330	4,850	6,480	7,320

Source: SITRAMP Estimate

#### 3.8.1 Manual Surveillance System

The costs (total project cost and annual operation and maintenance cost) for each alternative TDM area with the manual surveillance system are estimated in Table 3.8.3. As the manual surveillance system is planned for the short term, annual revenues in each levying case for year 2007 are estimated and attached in the bottom of the table. For more details of cost estimation, Tables from 3.8.4 to 3.8.9 can be referred to. The project cost of this labor-intensive system for the short term is much lower than the other two mechanical systems (i.e., ERP and camera surveillance) which are targeted for the long term.

No toll booths are necessary in this system, but some roadside sales booths where a variety of licenses/stickers can be purchased before entering the TDM area need to be constructed. However, not so many sales booths are necessary compared to the toll booth for each lane because quite many drivers are expected to use weekly or monthly licenses/stickers. Furthermore, such licenses/stickers can be purchased at many other different locations such as post offices, gas stations, vehicle registration offices, convenience stores, and so on.

Major items for annual operation and maintenance cost will include printing of those licenses/stickers as well as personnel cost of sales booth staff and inspectors. Anyway, the operation and maintenance cost is by far smaller and nearly negligible as compared to the expected annual revenue.

**Table 3.8.3 Estimation of Project Cost (Manual Surveillance System) and Annual Revenue**

[billion Rp.]

Item		Alt.1	Alt.2	Alt.3	Alt.4	Alt.5	Alt.6
(1)	Outstation Equipment	35.5	38.6	54.2	57.4	56.3	72.0
(A)	<b>Total Construction Cost ((1)+(2)+(3)+(4))</b>	<b>35.5</b>	<b>38.6</b>	<b>54.2</b>	<b>57.4</b>	<b>56.3</b>	<b>72.0</b>
(2)	Technical Assistance	23.0	23.0	23.0	23.0	23.0	23.0
(B)	Physical ontingency (10% of (A))	3.5	3.9	5.4	5.7	5.6	7.2
(C)	VAT (10% of (A))	3.5	3.9	5.4	5.7	5.6	7.2
<b>Total Project Cost ((A)+(5)+(B)+(C))</b>		<b>65.6</b>	<b>69.3</b>	<b>88.1</b>	<b>91.8</b>	<b>90.6</b>	<b>109.4</b>
Annual Operation and Maintenance		18.2	19.9	27.6	29.3	31.1	37.5
Annual Revenue (2007)	Case 1 (=Rp. 4,000)	360	440	680	760	1,010	1,160
	Case 2 (=Rp. 8,000)	690	830	1,280	1,430	1,880	2,170
	Case 3 (=Rp.12,000)	960	1,170	1,760	1,980	2,590	3,010
	Case 4 (=Rp.16,000)	1,180	1,430	2,130	2,390	3,110	3,640
	Case 5 (=Rp.20,000)	1,330	1,620	2,370	2,670	3,440	4,070

**Table 3.8.4 Detailed Manual Surveillance Cost Breakdown for Alternative 1**

	Unit	Quantity	Unit Price		Amount		Total (thousand)	Total (million Rp.)
			thousand Yen	thousand Rp.	thousand Yen	thousand Rp.		
<b>1. Outstation Equipment</b>								
Gate structure	no.	34	3,000	10,000	102,000	340,000	106,363	8,288
Power supply, etc.	no.	34		20,000	0	680,000	8,726	680
License sales booth	no.	34	10,000		340,000	0	340,000	26,494
Sub-total					442,000	1,020,000	455,089	35,462
<b>Total Construction Cost</b>					<b>442,000</b>	<b>1,020,000</b>	<b>455,089</b>	<b>35,462</b>
<b>2. Technical Assistance</b>								
<b>2.1 Design</b>								
Foreign consultant	M/M	48	3,000		144,000	0	144,000	11,221
Local consultant	M/M	72		10,000	0	720,000	9,240	720
Office expense	month	12		80,000	0	960,000	12,320	960
<b>2.2 Construction Supervision</b>								
Foreign consultant	M/M	36	3,000		108,000	0	108,000	8,416
Local consultant	M/M	72		10,000	0	720,000	9,240	720
Office expense	month	12		80,000	0	960,000	12,320	960
Sub-total					252,000	3,360,000	295,120	22,997
Contingency (10% of construction cost)					44,200	102,000	45,509	3,546
VAT (10% on construction cost)					44,200	102,000	45,509	3,546
<b>Total Project Cost (incl. construction)</b>					<b>782,400</b>	<b>4,584,000</b>	<b>841,227</b>	<b>65,551</b>
<b>3. Annual Operation and Maintenance</b>								
Operation and management staff	person	10		60,000	0	600,000	7,700	600
License sales booth staff	person	136		25,000	0	3,400,000	43,632	3,400
License inspectors	person	308		25,000	0	7,700,000	98,814	7,700
Office, transportation, etc.	LS	1		500,000	0	500,000	6,416	500
License sticker, etc.	LS	1		4,958,000	0	4,958,000	63,626	4,958
Maintenance contract	LS	1		1,000,000	0	1,000,000	12,833	1,000
<b>Annual O/M Cost</b>					<b>0</b>	<b>18,158,000</b>	<b>233,021</b>	<b>18,158</b>

**Table 3.8.5 Detailed Manual Surveillance Cost Breakdown for Alternative 2**

	Unit	Quantity	Unit Price		Amount		Total (thousand)	Total (million Rp.)
			thousand Yen	thousand Rp.	thousand Yen	thousand Rp.		
<b>1. Outstation Equipment</b>								
Gate structure	no.	37	3,000	10,000	111,000	370,000	115,748	9,020
Power supply, etc.	no.	37		20,000	0	740,000	9,496	740
License sales booth	no.	37	10,000		370,000	0	370,000	28,832
Sub-total					481,000	1,110,000	495,244	38,592
<b>Total Construction Cost</b>					<b>481,000</b>	<b>1,110,000</b>	<b>495,244</b>	<b>38,592</b>
<b>2. Technical Assistance</b>								
<b>2.1 Design</b>								
Foreign consultant	M/M	48	3,000		144,000	0	144,000	11,221
Local consultant	M/M	72		10,000	0	720,000	9,240	720
Office expense	month	12		80,000	0	960,000	12,320	960
<b>2.2 Construction Supervision</b>								
Foreign consultant	M/M	36	3,000		108,000	0	108,000	8,416
Local consultant	M/M	72		10,000	0	720,000	9,240	720
Office expense	month	12		80,000	0	960,000	12,320	960
Sub-total					252,000	3,360,000	295,120	22,997
Contingency (10% of construction cost)					48,100	111,000	49,524	3,859
VAT (10% on construction cost)					48,100	111,000	49,524	3,859
<b>Total Project Cost (incl. construction)</b>					<b>829,200</b>	<b>4,692,000</b>	<b>889,412</b>	<b>69,307</b>
<b>3. Annual Operation and Maintenance</b>								
Operation and management staff	person	10		60,000	0	600,000	7,700	600
License sales booth staff	person	148		25,000	0	3,700,000	47,482	3,700
License inspectors	person	328		25,000	0	8,200,000	105,230	8,200
Office, transportation, etc.	LS	1		500,000	0	500,000	6,416	500
License sticker, etc.	LS	1		5,920,000	0	5,920,000	75,971	5,920
Maintenance contract	LS	1		1,000,000	0	1,000,000	12,833	1,000
<b>Annual O/M Cost</b>					<b>0</b>	<b>19,920,000</b>	<b>255,632</b>	<b>19,920</b>

**Table 3.8.6 Detailed Manual Surveillance Cost Breakdown for Alternative 3**

	Unit	Quantity	Unit Price		Amount		Total (thousand)	Total (million Rp.)
			thousand Yen	thousand Rp.	thousand Yen	thousand Rp.		
<b>1. Outstation Equipment</b>								
Gate structure	no.	52	3,000	10,000	156,000	520,000	162,673	12,676
Power supply, etc.	no.	52		20,000	0	1,040,000	13,346	1,040
License sales booth	no.	52	10,000		520,000	0	520,000	40,521
Sub-total					676,000	1,560,000	696,019	54,237
<b>Total Construction Cost</b>					<b>676,000</b>	<b>1,560,000</b>	<b>696,019</b>	<b>54,237</b>
<b>2. Technical Assistance</b>								
<b>2.1 Design</b>								
Foreign consultant	M/M	48	3,000		144,000	0	144,000	11,221
Local consultant	M/M	72		10,000	0	720,000	9,240	720
Office expense	month	12		80,000	0	960,000	12,320	960
<b>2.2 Construction Supervision</b>								
Foreign consultant	M/M	36	3,000		108,000	0	108,000	8,416
Local consultant	M/M	72		10,000	0	720,000	9,240	720
Office expense	month	12		80,000	0	960,000	12,320	960
Sub-total					252,000	3,360,000	295,120	22,997
Contingency (10% of construction cost)					67,600	156,000	69,602	5,424
VAT (10% on construction cost)					67,600	156,000	69,602	5,424
<b>Total Project Cost (incl. construction)</b>					<b>1,063,200</b>	<b>5,232,000</b>	<b>1,130,343</b>	<b>88,082</b>
<b>3. Annual Operation and Maintenance</b>								
Operation and management staff	person	10		60,000	0	600,000	7,700	600
License sales booth staff	person	208		25,000	0	5,200,000	66,731	5,200
License inspectors	person	456		25,000	0	11,400,000	146,296	11,400
Office, transportation, etc.	LS	1		500,000	0	500,000	6,416	500
License sticker, etc.	LS	1		8,880,000	0	8,880,000	113,957	8,880
Maintenance contract	LS	1		1,000,000	0	1,000,000	12,833	1,000
<b>Annual O/M Cost</b>					<b>0</b>	<b>27,580,000</b>	<b>353,933</b>	<b>27,580</b>

**Table 3.8.7 Detailed Manual Surveillance Cost Breakdown for Alternative 4**

	Unit	Quantity	Unit Price		Amount		Total (thousand)	Total (million Rp.)
			thousand Yen	thousand Rp.	thousand Yen	thousand Rp.		
<b>1. Outstation Equipment</b>								
Gate structure	no.	55	3,000	10,000	165,000	550,000	172,058	13,408
Power supply, etc.	no.	55		20,000	0	1,100,000	14,116	1,100
License sales booth	no.	55	10,000		550,000	0	550,000	42,858
Sub-total					715,000	1,650,000	736,174	57,366
<b>Total Construction Cost</b>					<b>715,000</b>	<b>1,650,000</b>	<b>736,174</b>	<b>57,366</b>
<b>2. Technical Assistance</b>								
<b>2.1 Design</b>								
Foreign consultant	M/M	48	3,000		144,000	0	144,000	11,221
Local consultant	M/M	72		10,000	0	720,000	9,240	720
Office expense	month	12		80,000	0	960,000	12,320	960
<b>2.2 Construction Supervision</b>								
Foreign consultant	M/M	36	3,000		108,000	0	108,000	8,416
Local consultant	M/M	72		10,000	0	720,000	9,240	720
Office expense	month	12		80,000	0	960,000	12,320	960
Sub-total					252,000	3,360,000	295,120	22,997
Contingency (10% of construction cost)					71,500	165,000	73,617	5,737
VAT (10% on construction cost)					71,500	165,000	73,617	5,737
<b>Total Project Cost (incl. construction)</b>					<b>1,110,000</b>	<b>5,340,000</b>	<b>1,178,528</b>	<b>91,837</b>
<b>3. Annual Operation and Maintenance</b>								
Operation and management staff	person	10		60,000	0	600,000	7,700	600
License sales booth staff	person	220		25,000	0	5,500,000	70,581	5,500
License inspectors	person	476		25,000	0	11,900,000	152,712	11,900
Office, transportation, etc.	LS	1		500,000	0	500,000	6,416	500
License sticker, etc.	LS	1		9,842,000	0	9,842,000	126,302	9,842
Maintenance contract	LS	1		1,000,000	0	1,000,000	12,833	1,000
<b>Annual O/M Cost</b>					<b>0</b>	<b>29,342,000</b>	<b>376,544</b>	<b>29,342</b>

**Table 3.8.8 Detailed Manual Surveillance Cost Breakdown for Alternative 5**

	Unit	Quantity	Unit Price		Amount		Total (thousand)	Total (million Rp.)
			thousand Yen	thousand Rp.	thousand Yen	thousand Rp.		
<b>1. Outstation Equipment</b>								
Gate structure	no.	54	3,000	10,000	162,000	540,000	168,930	13,164
Power supply, etc.	no.	54		20,000	0	1,080,000	13,860	1,080
License sales booth	no.	54	10,000		540,000	0	540,000	42,079
Sub-total					702,000	1,620,000	722,790	56,323
<b>Total Construction Cost</b>					<b>702,000</b>	<b>1,620,000</b>	<b>722,790</b>	<b>56,323</b>
<b>2. Technical Assistance</b>								
<b>2.1 Design</b>								
Foreign consultant	M/M	48	3,000		144,000	0	144,000	11,221
Local consultant	M/M	72		10,000	0	720,000	9,240	720
Office expense	month	12		80,000	0	960,000	12,320	960
<b>2.2 Construction Supervision</b>								
Foreign consultant	M/M	36	3,000		108,000	0	108,000	8,416
Local consultant	M/M	72		10,000	0	720,000	9,240	720
Office expense	month	12		80,000	0	960,000	12,320	960
Sub-total					252,000	3,360,000	295,120	22,997
Contingency (10% of construction cost)					70,200	162,000	72,279	5,632
VAT (10% on construction cost)					70,200	162,000	72,279	5,632
<b>Total Project Cost (incl. construction)</b>					<b>1,094,400</b>	<b>5,304,000</b>	<b>1,162,468</b>	<b>90,584</b>
<b>3. Annual Operation and Maintenance</b>								
Operation and management staff	person	10		60,000	0	600,000	7,700	600
License sales booth staff	person	216		25,000	0	5,400,000	69,298	5,400
License inspectors	person	448		25,000	0	11,200,000	143,729	11,200
Office, transportation, etc.	LS	1		500,000	0	500,000	6,416	500
License sticker, etc.	LS	1		12,358,000	0	12,358,000	158,589	12,358
Maintenance contract	LS	1		1,000,000	0	1,000,000	12,833	1,000
<b>Annual O/M Cost</b>					<b>0</b>	<b>31,058,000</b>	<b>398,565</b>	<b>31,058</b>

**Table 3.8.9 Detailed Manual Surveillance Cost Breakdown for Alternative 6**

	Unit	Quantity	Unit Price		Amount		Total (thousand)	Total (million Rp.)
			thousand Yen	thousand Rp.	thousand Yen	thousand Rp.		
<b>1. Outstation Equipment</b>								
Gate structure	no.	69	3,000	10,000	207,000	690,000	215,855	16,820
Power supply, etc.	no.	69		20,000	0	1,380,000	17,709	1,380
License sales booth	no.	69	10,000		690,000	0	690,000	53,768
Sub-total					897,000	2,070,000	923,564	71,968
<b>Total Construction Cost</b>					<b>897,000</b>	<b>2,070,000</b>	<b>923,564</b>	<b>71,968</b>
<b>2. Technical Assistance</b>								
<b>2.1 Design</b>								
Foreign consultant	M/M	48	3,000		144,000	0	144,000	11,221
Local consultant	M/M	72		10,000	0	720,000	9,240	720
Office expense	month	12		80,000	0	960,000	12,320	960
<b>2.2 Construction Supervision</b>								
Foreign consultant	M/M	36	3,000		108,000	0	108,000	8,416
Local consultant	M/M	72		10,000	0	720,000	9,240	720
Office expense	month	12		80,000	0	960,000	12,320	960
Sub-total					252,000	3,360,000	295,120	22,997
Contingency (10% of construction cost)					89,700	207,000	92,356	7,197
VAT (10% on construction cost)					89,700	207,000	92,356	7,197
<b>Total Project Cost (incl. construction)</b>					<b>1,328,400</b>	<b>5,844,000</b>	<b>1,403,396</b>	<b>109,359</b>
<b>3. Annual Operation and Maintenance</b>								
Operation and management staff	person	10		60,000	0	600,000	7,700	600
License sales booth staff	person	276		25,000	0	6,900,000	88,547	6,900
License inspectors	person	564		25,000	0	14,100,000	180,944	14,100
Office, transportation, etc.	LS	1		500,000	0	500,000	6,416	500
License sticker, etc.	LS	1		14,356,000	0	14,356,000	184,230	14,356
Maintenance contract	LS	1		1,000,000	0	1,000,000	12,833	1,000
<b>Annual O/M Cost</b>					<b>0</b>	<b>37,456,000</b>	<b>480,670</b>	<b>37,456</b>



### 3.8.2 ERP System

The costs (total project cost and annual operation and maintenance cost) for each alternative TDM area with the above-mentioned ERP system are estimated in Table 3.8.10. Annual revenues in each levying case for years 2007 and 2020 are also estimated and shown in the bottom half of the table. For more details of cost estimation, Tables from 3.8.11 to 3.8.16 can be referred to. The project cost of the six alternatives is estimated as ranging from Rp. 440 billion to Rp. 690 billion and the investment cost of TDM originally estimated in the SITRAMP Master Plan is within that range (Rp. 500 billion). Besides the cost in Table 3.8.10, it needs the cost of purchase/ installation of in-vehicle units (IU), which requires almost Rp. 1.0 million per vehicle.

As for annual revenues, the amount will greatly vary depending on the toll levy level, scale of the TDM area, and years. However, these figures imply that it may not be so difficult to achieve the revenue of Rp. 15,000 billion expected as a total revenue from TDM until 2020 in the Master Plan, which is, very roughly speaking, approximately Rp. 1,000 billion per year. It should be noted that the actual annual revenues might decrease if various kinds of levy reductions are considered for residents inside the TDM area and so on. On the contrary, the actual annual revenue may increase if TDM is applied to other vehicle types such as motorcycles.

**Table 3.8.10 Estimation of Project Cost (ERP System) and Annual Revenue**

		[billion Rp.]					
Item		Alt.1	Alt.2	Alt.3	Alt.4	Alt.5	Alt.6
(1)	Control Center System	61.2	61.2	61.2	61.2	61.2	61.2
(2)	Field Equipment	242.8	259.2	356.7	373.1	353.7	444.3
(3)	In-Vehicle Unit	0.0	0.0	0.0	0.0	0.0	0.0
(4)	Re-Loading Machine	26.4	26.4	26.4	26.4	26.4	26.4
(A)	<b>Total Construction Cost ((1)+(2)+(3)+(4))</b>	<b>330.4</b>	<b>346.8</b>	<b>444.3</b>	<b>460.7</b>	<b>441.2</b>	<b>531.9</b>
(5)	Technical Assistance	47.8	47.8	47.8	47.8	47.8	47.8
(B)	Physical Contingency (10% of (A))	33.0	34.7	44.4	46.1	44.1	53.2
(C)	VAT (10% of (A))	33.0	34.7	44.4	46.1	44.1	53.2
<b>Total Project Cost ((A)+(5)+(B)+(C))</b>		<b>444.3</b>	<b>463.9</b>	<b>581.0</b>	<b>600.7</b>	<b>577.3</b>	<b>686.1</b>
Annual Operation and Maintenance		24.3	25.2	29.5	30.4	29.6	33.9
Annual Revenue (2007)	Case 1 (=Rp. 4,000)	360	440	680	760	1,010	1,160
	Case 2 (=Rp. 8,000)	690	830	1,280	1,430	1,880	2,170
	Case 3 (=Rp.12,000)	960	1,170	1,760	1,980	2,590	3,010
	Case 4 (=Rp.16,000)	1,180	1,430	2,130	2,390	3,110	3,640
	Case 5 (=Rp.20,000)	1,330	1,620	2,370	2,670	3,440	4,070
Annual Revenue (2020)	Case 1 (=Rp. 4,000)	550	670	1,060	1,190	1,590	1,790
	Case 2 (=Rp. 8,000)	1,060	1,310	2,050	2,300	3,070	3,460
	Case 3 (=Rp.12,000)	1,530	1,880	2,940	3,290	4,400	4,960
	Case 4 (=Rp.16,000)	1,930	2,380	3,700	4,140	5,540	6,250
	Case 5 (=Rp.20,000)	2,270	2,800	4,330	4,850	6,480	7,320

**Table 3.8.11 Detailed ERP Cost Breakdown for Alternative 1**

	Unit	Quantity	Unit Price		Amount		Total (thousand)	Total (million Rp.)
			thousand Yen	thousand Rp.	thousand Yen	thousand Rp.		
<b>1. Control Center System</b>								
Monitoring and control server	set	2	50,000		100,000	0	100,000	7,792
Database server	set	2	40,000		80,000	0	80,000	6,234
Application server	set	2	30,000		60,000	0	60,000	4,675
LAN equipment	LS	1	5,000		5,000	0	5,000	390
Communication control unit	set	1	15,000		15,000	0	15,000	1,169
Monitoring & control software	LS	1	150,000		150,000	0	150,000	11,689
Application software	LS	1	200,000		200,000	0	200,000	15,585
Database software	LS	1	10,000		10,000	0	10,000	779
Database data	LS	1		1,000,000	0	1,000,000	12,833	1,000
Control center building	m2	500		20,000	0	10,000,000	128,329	10,000
Control center facilities	LS	1	15,000	500,000	15,000	500,000	21,416	1,669
Office facilities	LS	1		200,000	0	200,000	2,567	200
Sub-total					635,000	11,700,000	785,145	61,182
<b>2. Field Equipment</b>								
Outstation Computer	no.	34	5,000		170,000	0	170,000	13,247
Control software	LS	1	120,000		120,000	0	120,000	9,351
Interrogator	no.	77	25,000		1,925,000	0	1,925,000	150,005
TV camera and image processor	no.	77	8,000		616,000	0	616,000	48,001
Gate structure	no.	34	3,000	10,000	102,000	340,000	106,363	8,288
Power supply, etc.	no.	34		20,000	0	680,000	8,726	680
Manual tollgate	no.	17	10,000		170,000	0	170,000	13,247
Sub-total					3,103,000	1,020,000	3,116,089	242,819
3. In-Vehicle Unit	no.		10	100	0	0	0	0
4. Re-Loading Machine	no.	300	1,000	10,000	300,000	3,000,000	338,499	26,377
<b>Total Construction Cost</b>					<b>4,038,000</b>	<b>15,720,000</b>	<b>4,239,733</b>	<b>330,378</b>
<b>5. Technical Assistance</b>								
<b>5.1 Design</b>								
Foreign consultant	M/M	108	3,000		324,000	0	324,000	25,248
Local consultant	M/M	144		10,000	0	1,440,000	18,479	1,440
Office expense	month	18		80,000	0	1,440,000	18,479	1,440
<b>5.2 Construction Supervision</b>								
Foreign consultant	M/M	72	3,000		216,000	0	216,000	16,832
Local consultant	M/M	144		10,000	0	1,440,000	18,479	1,440
Office expense	month	18		80,000	0	1,440,000	18,479	1,440
Sub-total					540,000	5,760,000	613,916	47,840
Contingency (10% of construction cost)					403,800	1,572,000	423,973	33,038
VAT (10% on construction cost)					403,800	1,572,000	423,973	33,038
<b>Total Project Cost (incl. construction)</b>					<b>5,385,600</b>	<b>24,624,000</b>	<b>5,701,595</b>	<b>444,294</b>
<b>6. Annual Operation and Maintenance</b>								
Operation and management staff	person	50		60,000	0	3,000,000	38,499	3,000
Manual toll gate staff	person	68		25,000	0	1,700,000	21,816	1,700
Office, transportation, etc.	LS	1		1,500,000	0	1,500,000	19,249	1,500
Electricity, communication, etc.	LS	1		1,000,000	0	1,000,000	12,833	1,000
Leased line	no.	34		50,000	0	1,700,000	21,816	1,700
Spare parts	LS	1	121,140		121,140	0	121,140	9,440
Maintenance contract	LS	1		6,000,000	0	6,000,000	76,998	6,000
<b>Annual O/M Cost</b>					<b>121,140</b>	<b>14,900,000</b>	<b>312,351</b>	<b>24,340</b>

**Assumptions:**

Number of Gantry and Lanes	Gate	Lane
1-lane type	9	9
2-lane type	12	24
3-lane type	8	24
4-lane type	5	20
5-lane type		0
Total	34	77

**Table 3.8.12 Detailed ERP Cost Breakdown for Alternative 2**

	Unit	Quantity	Unit Price		Amount		Total (thousand)	Total (million Rp.)
			thousand Yen	thousand Rp.	thousand Yen	thousand Rp.		
<b>1. Control Center System</b>								
Monitoring and control server	set	2	50,000		100,000	0	100,000	7,792
Database server	set	2	40,000		80,000	0	80,000	6,234
Application server	set	2	30,000		60,000	0	60,000	4,675
LAN equipment	LS	1	5,000		5,000	0	5,000	390
Communication control unit	set	1	15,000		15,000	0	15,000	1,169
Monitoring & control software	LS	1	150,000		150,000	0	150,000	11,689
Application software	LS	1	200,000		200,000	0	200,000	15,585
Database software	LS	1	10,000		10,000	0	10,000	779
Database data	LS	1		1,000,000	0	1,000,000	12,833	1,000
Control center building	m2	500		20,000	0	10,000,000	128,329	10,000
Control center facilities	LS	1	15,000	500,000	15,000	500,000	21,416	1,669
Office facilities	LS	1		200,000	0	200,000	2,567	200
Sub-total					635,000	11,700,000	785,145	61,182
<b>2. Field Equipment</b>								
Outstation Computer	no.	37	5,000		185,000	0	185,000	14,416
Control software	LS	1	120,000		120,000	0	120,000	9,351
Interrogator	no.	82	25,000		2,050,000	0	2,050,000	159,745
TV camera and image processor	no.	82	8,000		656,000	0	656,000	51,118
Gate structure	no.	37	3,000	10,000	111,000	370,000	115,748	9,020
Power supply, etc.	no.	37		20,000	0	740,000	9,496	740
Manual tollgate	no.	19	10,000		190,000	0	190,000	14,806
Sub-total					3,312,000	1,110,000	3,326,244	259,196
<b>3. In-Vehicle Unit</b>	no.		10	100	0	0	0	0
<b>4. Re-Loading Machine</b>	no.	300	1,000	10,000	300,000	3,000,000	338,499	26,377
<b>Total Construction Cost</b>					<b>4,247,000</b>	<b>15,810,000</b>	<b>4,449,888</b>	<b>346,755</b>
<b>5. Technical Assistance</b>								
<b>5.1 Design</b>								
Foreign consultant	M/M	108	3,000		324,000	0	324,000	25,248
Local consultant	M/M	144		10,000	0	1,440,000	18,479	1,440
Office expense	month	18		80,000	0	1,440,000	18,479	1,440
<b>5.2 Construction Supervision</b>								
Foreign consultant	M/M	72	3,000		216,000	0	216,000	16,832
Local consultant	M/M	144		10,000	0	1,440,000	18,479	1,440
Office expense	month	18		80,000	0	1,440,000	18,479	1,440
Sub-total					540,000	5,760,000	613,916	47,840
Contingency (10% of construction cost)					424,700	1,581,000	444,989	34,676
VAT (10% on construction cost)					424,700	1,581,000	444,989	34,676
<b>Total Project Cost (incl. construction)</b>					<b>5,636,400</b>	<b>24,732,000</b>	<b>5,953,782</b>	<b>463,947</b>
<b>6. Annual Operation and Maintenance</b>								
Operation and management staff	person	50		60,000	0	3,000,000	38,499	3,000
Manual toll gate staff	person	76		25,000	0	1,900,000	24,383	1,900
Office, transportation, etc.	LS	1		1,500,000	0	1,500,000	19,249	1,500
Electricity, communication, etc.	LS	1		1,000,000	0	1,000,000	12,833	1,000
Leased line	no.	37		50,000	0	1,850,000	23,741	1,850
Spare parts	LS	1	127,410		127,410	0	127,410	9,928
Maintenance contract	LS	1		6,000,000	0	6,000,000	76,998	6,000
<b>Annual O/M Cost</b>					<b>127,410</b>	<b>15,250,000</b>	<b>323,113</b>	<b>25,178</b>

**Assumptions:**

Number of Gantry and Lanes	Gate	Lane
1-lane type	10	10
2-lane type	13	26
3-lane type	10	30
4-lane type	4	16
5-lane type		0
Total	37	82

**Table 3.8.13 Detailed ERP Cost Breakdown for Alternative 3**

	Unit	Quantity	Unit Price		Amount		Total (thousand)	Total (million Rp.)
			thousand Yen	thousand Rp.	thousand Yen	thousand Rp.		
<b>1. Control Center System</b>								
Monitoring and control server	set	2	50,000		100,000	0	100,000	7,792
Database server	set	2	40,000		80,000	0	80,000	6,234
Application server	set	2	30,000		60,000	0	60,000	4,675
LAN equipment	LS	1	5,000		5,000	0	5,000	390
Communication control unit	set	1	15,000		15,000	0	15,000	1,169
Monitoring & control software	LS	1	150,000		150,000	0	150,000	11,689
Application software	LS	1	200,000		200,000	0	200,000	15,585
Database software	LS	1	10,000		10,000	0	10,000	779
Database data	LS	1		1,000,000	0	1,000,000	12,833	1,000
Control center building	m2	500		20,000	0	10,000,000	128,329	10,000
Control center facilities	LS	1	15,000	500,000	15,000	500,000	21,416	1,669
Office facilities	LS	1		200,000	0	200,000	2,567	200
Sub-total					635,000	11,700,000	785,145	61,182
<b>2. Field Equipment</b>								
Outstation Computer	no.	52	5,000		260,000	0	260,000	20,260
Control software	LS	1	120,000		120,000	0	120,000	9,351
Interrogator	no.	114	25,000		2,850,000	0	2,850,000	222,085
TV camera and image processor	no.	114	8,000		912,000	0	912,000	71,067
Gate structure	no.	52	3,000	10,000	156,000	520,000	162,673	12,676
Power supply, etc.	no.	52		20,000	0	1,040,000	13,346	1,040
Manual tollgate	no.	26	10,000		260,000	0	260,000	20,260
Sub-total					4,558,000	1,560,000	4,578,019	356,739
3. In-Vehicle Unit	no.		10	100	0	0	0	0
4. Re-Loading Machine	no.	300	1,000	10,000	300,000	3,000,000	338,499	26,377
<b>Total Construction Cost</b>					<b>5,493,000</b>	<b>16,260,000</b>	<b>5,701,663</b>	<b>444,298</b>
<b>5. Technical Assistance</b>								
<b>5.1 Design</b>								
Foreign consultant	M/M	108	3,000		324,000	0	324,000	25,248
Local consultant	M/M	144		10,000	0	1,440,000	18,479	1,440
Office expense	month	18		80,000	0	1,440,000	18,479	1,440
<b>5.2 Construction Supervision</b>								
Foreign consultant	M/M	72	3,000		216,000	0	216,000	16,832
Local consultant	M/M	144		10,000	0	1,440,000	18,479	1,440
Office expense	month	18		80,000	0	1,440,000	18,479	1,440
Sub-total					540,000	5,760,000	613,916	47,840
Contingency (10% of construction cost)					549,300	1,626,000	570,166	44,430
VAT (10% on construction cost)					549,300	1,626,000	570,166	44,430
<b>Total Project Cost (incl. construction)</b>					<b>7,131,600</b>	<b>25,272,000</b>	<b>7,455,911</b>	<b>580,998</b>
<b>6. Annual Operation and Maintenance</b>								
Operation and management staff	person	50		60,000	0	3,000,000	38,499	3,000
Manual toll gate staff	person	104		25,000	0	2,600,000	33,366	2,600
Office, transportation, etc.	LS	1		1,500,000	0	1,500,000	19,249	1,500
Electricity, communication, etc.	LS	1		1,000,000	0	1,000,000	12,833	1,000
Leased line	no.	52		50,000	0	2,600,000	33,366	2,600
Spare parts	LS	1	164,790		164,790	0	164,790	12,841
Maintenance contract	LS	1		6,000,000	0	6,000,000	76,998	6,000
<b>Annual O/M Cost</b>					<b>164,790</b>	<b>16,700,000</b>	<b>379,101</b>	<b>29,541</b>

**Assumptions:**

Number of Gantry and Lanes	Gate	Lane
1-lane type	15	15
2-lane type	20	40
3-lane type	10	30
4-lane type	6	24
5-lane type	1	5
Total	52	114

**Table 3.8.14 Detailed ERP Cost Breakdown for Alternative 4**

	Unit	Quantity	Unit Price		Amount		Total (thousand)	Total (million Rp.)
			thousand Yen	thousand Rp.	thousand Yen	thousand Rp.		
<b>1. Control Center System</b>								
Monitoring and control server	set	2	50,000		100,000	0	100,000	7,792
Database server	set	2	40,000		80,000	0	80,000	6,234
Application server	set	2	30,000		60,000	0	60,000	4,675
LAN equipment	LS	1	5,000		5,000	0	5,000	390
Communication control unit	set	1	15,000		15,000	0	15,000	1,169
Monitoring & control software	LS	1	150,000		150,000	0	150,000	11,689
Application software	LS	1	200,000		200,000	0	200,000	15,585
Database software	LS	1	10,000		10,000	0	10,000	779
Database data	LS	1		1,000,000	0	1,000,000	12,833	1,000
Control center building	m2	500		20,000	0	10,000,000	128,329	10,000
Control center facilities	LS	1	15,000	500,000	15,000	500,000	21,416	1,669
Office facilities	LS	1		200,000	0	200,000	2,567	200
Sub-total					635,000	11,700,000	785,145	61,182
<b>2. Field Equipment</b>								
Outstation Computer	no.	55	5,000		275,000	0	275,000	21,429
Control software	LS	1	120,000		120,000	0	120,000	9,351
Interrogator	no.	119	25,000		2,975,000	0	2,975,000	231,825
TV camera and image processor	no.	119	8,000		952,000	0	952,000	74,184
Gate structure	no.	55	3,000	10,000	165,000	550,000	172,058	13,408
Power supply, etc.	no.	55		20,000	0	1,100,000	14,116	1,100
Manual tollgate	no.	28	10,000		280,000	0	280,000	21,819
Sub-total					4,767,000	1,650,000	4,788,174	373,116
3. In-Vehicle Unit	no.		10	100	0	0	0	0
4. Re-Loading Machine	no.	300	1,000	10,000	300,000	3,000,000	338,499	26,377
<b>Total Construction Cost</b>					<b>5,702,000</b>	<b>16,350,000</b>	<b>5,911,818</b>	<b>460,675</b>
<b>5. Technical Assistance</b>								
<b>5.1 Design</b>								
Foreign consultant	M/M	108	3,000		324,000	0	324,000	25,248
Local consultant	M/M	144		10,000	0	1,440,000	18,479	1,440
Office expense	month	18		80,000	0	1,440,000	18,479	1,440
<b>5.2 Construction Supervision</b>								
Foreign consultant	M/M	72	3,000		216,000	0	216,000	16,832
Local consultant	M/M	144		10,000	0	1,440,000	18,479	1,440
Office expense	month	18		80,000	0	1,440,000	18,479	1,440
Sub-total					540,000	5,760,000	613,916	47,840
Contingency (10% of construction cost)					570,200	1,635,000	591,182	46,068
VAT (10% on construction cost)					570,200	1,635,000	591,182	46,068
<b>Total Project Cost (incl. construction)</b>					<b>7,382,400</b>	<b>25,380,000</b>	<b>7,708,098</b>	<b>600,651</b>
<b>6. Annual Operation and Maintenance</b>								
Operation and management staff	person	50		60,000	0	3,000,000	38,499	3,000
Manual toll gate staff	person	112		25,000	0	2,800,000	35,932	2,800
Office, transportation, etc.	LS	1		1,500,000	0	1,500,000	19,249	1,500
Electricity, communication, etc.	LS	1		1,000,000	0	1,000,000	12,833	1,000
Leased line	no.	55		50,000	0	2,750,000	35,291	2,750
Spare parts	LS	1	171,060		171,060	0	171,060	13,330
Maintenance contract	LS	1		6,000,000	0	6,000,000	76,998	6,000
<b>Annual O/M Cost</b>					<b>171,060</b>	<b>17,050,000</b>	<b>389,862</b>	<b>30,380</b>

**Assumptions:**

Number of Gantry and Lanes	Gate	Lane
1-lane type	16	16
2-lane type	21	42
3-lane type	12	36
4-lane type	5	20
5-lane type	1	5
Total	55	119

**Table 3.8.15 Detailed ERP Cost Breakdown for Alternative 5**

	Unit	Quantity	Unit Price		Amount		Total (thousand)	Total (million Rp.)
			thousand Yen	thousand Rp.	thousand Yen	thousand Rp.		
<b>1. Control Center System</b>								
Monitoring and control server	set	2	50,000		100,000	0	100,000	7,792
Database server	set	2	40,000		80,000	0	80,000	6,234
Application server	set	2	30,000		60,000	0	60,000	4,675
LAN equipment	LS	1	5,000		5,000	0	5,000	390
Communication control unit	set	1	15,000		15,000	0	15,000	1,169
Monitoring & control software	LS	1	150,000		150,000	0	150,000	11,689
Application software	LS	1	200,000		200,000	0	200,000	15,585
Database software	LS	1	10,000		10,000	0	10,000	779
Database data	LS	1		1,000,000	0	1,000,000	12,833	1,000
Control center building	m2	500		20,000	0	10,000,000	128,329	10,000
Control center facilities	LS	1	15,000	500,000	15,000	500,000	21,416	1,669
Office facilities	LS	1		200,000	0	200,000	2,567	200
Sub-total					635,000	11,700,000	785,145	61,182
<b>2. Field Equipment</b>								
Outstation Computer	no.	54	5,000		270,000	0	270,000	21,040
Control software	LS	1	120,000		120,000	0	120,000	9,351
Interrogator	no.	112	25,000		2,800,000	0	2,800,000	218,188
TV camera and image processor	no.	112	8,000		896,000	0	896,000	69,820
Gate structure	no.	54	3,000	10,000	162,000	540,000	168,930	13,164
Power supply, etc.	no.	54		20,000	0	1,080,000	13,860	1,080
Manual tollgate	no.	27	10,000		270,000	0	270,000	21,040
Sub-total					4,518,000	1,620,000	4,538,790	353,683
3. In-Vehicle Unit	no.		10	100	0	0	0	0
4. Re-Loading Machine	no.	300	1,000	10,000	300,000	3,000,000	338,499	26,377
<b>Total Construction Cost</b>					<b>5,453,000</b>	<b>16,320,000</b>	<b>5,662,434</b>	<b>441,242</b>
<b>5. Technical Assistance</b>								
<b>5.1 Design</b>								
Foreign consultant	M/M	108	3,000		324,000	0	324,000	25,248
Local consultant	M/M	144		10,000	0	1,440,000	18,479	1,440
Office expense	month	18		80,000	0	1,440,000	18,479	1,440
<b>5.2 Construction Supervision</b>								
Foreign consultant	M/M	72	3,000		216,000	0	216,000	16,832
Local consultant	M/M	144		10,000	0	1,440,000	18,479	1,440
Office expense	month	18		80,000	0	1,440,000	18,479	1,440
Sub-total					540,000	5,760,000	613,916	47,840
Contingency (10% of construction cost)					545,300	1,632,000	566,243	44,124
VAT (10% on construction cost)					545,300	1,632,000	566,243	44,124
<b>Total Project Cost (incl. construction)</b>					<b>7,083,600</b>	<b>25,344,000</b>	<b>7,408,836</b>	<b>577,330</b>
<b>6. Annual Operation and Maintenance</b>								
Operation and management staff	person	50		60,000	0	3,000,000	38,499	3,000
Manual toll gate staff	person	108		25,000	0	2,700,000	34,649	2,700
Office, transportation, etc.	LS	1		1,500,000	0	1,500,000	19,249	1,500
Electricity, communication, etc.	LS	1		1,000,000	0	1,000,000	12,833	1,000
Leased line	no.	54		50,000	0	2,700,000	34,649	2,700
Spare parts	LS	1	163,590		163,590	0	163,590	12,748
Maintenance contract	LS	1		6,000,000	0	6,000,000	76,998	6,000
<b>Annual O/M Cost</b>					<b>163,590</b>	<b>16,900,000</b>	<b>380,467</b>	<b>29,648</b>

**Assumptions:**

Number of Gantry and Lanes	Gate	Lane
1-lane type	21	21
2-lane type	19	38
3-lane type	6	18
4-lane type	5	20
5-lane type	3	15
Total	54	112

**Table 3.8.16 Detailed ERP Cost Breakdown for Alternative 6**

	Unit	Quantity	Unit Price		Amount		Total (thousand)	Total (million Rp.)
			thousand Yen	thousand Rp.	thousand Yen	thousand Rp.		
<b>1. Control Center System</b>								
Monitoring and control server	set	2	50,000		100,000	0	100,000	7,792
Database server	set	2	40,000		80,000	0	80,000	6,234
Application server	set	2	30,000		60,000	0	60,000	4,675
LAN equipment	LS	1	5,000		5,000	0	5,000	390
Communication control unit	set	1	15,000		15,000	0	15,000	1,169
Monitoring & control software	LS	1	150,000		150,000	0	150,000	11,689
Application software	LS	1	200,000		200,000	0	200,000	15,585
Database software	LS	1	10,000		10,000	0	10,000	779
Database data	LS	1		1,000,000	0	1,000,000	12,833	1,000
Control center building	m2	500		20,000	0	10,000,000	128,329	10,000
Control center facilities	LS	1	15,000	500,000	15,000	500,000	21,416	1,669
Office facilities	LS	1		200,000	0	200,000	2,567	200
Sub-total					635,000	11,700,000	785,145	61,182
<b>2. Field Equipment</b>								
Outstation Computer	no.	69	5,000		345,000	0	345,000	26,884
Control software	LS	1	120,000		120,000	0	120,000	9,351
Interrogator	no.	141	25,000		3,525,000	0	3,525,000	274,684
TV camera and image processor	no.	141	8,000		1,128,000	0	1,128,000	87,899
Gate structure	no.	69	3,000	10,000	207,000	690,000	215,855	16,820
Power supply, etc.	no.	69		20,000	0	1,380,000	17,709	1,380
Manual tollgate	no.	35	10,000		350,000	0	350,000	27,274
Sub-total					5,675,000	2,070,000	5,701,564	444,292
3. In-Vehicle Unit	no.		10	100	0	0	0	0
4. Re-Loading Machine	no.	300	1,000	10,000	300,000	3,000,000	338,499	26,377
<b>Total Construction Cost</b>					<b>6,610,000</b>	<b>16,770,000</b>	<b>6,825,208</b>	<b>531,851</b>
<b>5. Technical Assistance</b>								
<b>5.1 Design</b>								
Foreign consultant	M/M	108	3,000		324,000	0	324,000	25,248
Local consultant	M/M	144		10,000	0	1,440,000	18,479	1,440
Office expense	month	18		80,000	0	1,440,000	18,479	1,440
<b>5.2 Construction Supervision</b>								
Foreign consultant	M/M	72	3,000		216,000	0	216,000	16,832
Local consultant	M/M	144		10,000	0	1,440,000	18,479	1,440
Office expense	month	18		80,000	0	1,440,000	18,479	1,440
Sub-total					540,000	5,760,000	613,916	47,840
Contingency (10% of construction cost)					661,000	1,677,000	682,521	53,185
VAT (10% on construction cost)					661,000	1,677,000	682,521	53,185
<b>Total Project Cost (incl. construction)</b>					<b>8,472,000</b>	<b>25,884,000</b>	<b>8,804,166</b>	<b>686,061</b>
<b>6. Annual Operation and Maintenance</b>								
Operation and management staff	person	50		60,000	0	3,000,000	38,499	3,000
Manual toll gate staff	person	140		25,000	0	3,500,000	44,915	3,500
Office, transportation, etc.	LS	1		1,500,000	0	1,500,000	19,249	1,500
Electricity, communication, etc.	LS	1		1,000,000	0	1,000,000	12,833	1,000
Leased line	no.	69		50,000	0	3,450,000	44,274	3,450
Spare parts	LS	1	198,300		198,300	0	198,300	15,452
Maintenance contract	LS	1		6,000,000	0	6,000,000	76,998	6,000
<b>Annual O/M Cost</b>					<b>198,300</b>	<b>18,450,000</b>	<b>435,068</b>	<b>33,902</b>

**Assumptions:**

Number of Gantry and Lanes	Gate	Lane
1-lane type	24	24
2-lane type	27	54
3-lane type	10	30
4-lane type	7	28
5-lane type	1	5
Total	69	141

### 3.8.3 Camera-Surveillance System

The costs (total project cost and annual operation and maintenance cost) for each alternative TDM area in the case of camera-surveillance system are estimated in Table 3.8.17. Annual revenues in each levying case for years 2007 and 2020 attached in the bottom half of the table are the same as in Table 3.8.10. For more details of cost estimation, Tables from 3.8.18 to 3.8.23 can be referred to.

Compared with the ERP system, the camera-surveillance project cost is much lower and installation of in-vehicle unit is not necessary in this case. Even with the annual operation and maintenance cost, the total cost is lower than the SITRAMP Master Plan budget for TDM (= Rp. 500 billion for investment).

As for annual revenues, on the other hand, they are essentially the same as in the ERP system. If this camera-surveillance system really works, the system can enjoy the maximum benefit with the minimum investment cost.

**Table 3.8.17 Estimation of Project Cost (Camera-Surveillance System) and Annual Revenue**

		[billion Rp.]					
Item		Alt.1	Alt.2	Alt.3	Alt.4	Alt.5	Alt.6
(1)	Control Center System	61.2	61.2	61.2	61.2	61.2	61.2
(2)	Outstation Equipment	79.6	84.6	114.4	119.5	114.5	142.3
(A)	<b>Total Construction Cost ((1)+(2)+(3)+(4))</b>	<b>140.7</b>	<b>145.8</b>	<b>175.6</b>	<b>180.7</b>	<b>175.6</b>	<b>203.5</b>
(5)	Technical Assistance	34.5	34.5	34.5	34.5	34.5	34.5
(B)	Physical Contingency (10% of (A))	14.1	14.6	17.6	18.1	17.6	20.4
(C)	VAT (10% of (A))	14.1	14.6	17.6	18.1	17.6	20.4
<b>Total Project Cost ((A)+(5)+(B)+(C))</b>		<b>203.4</b>	<b>209.5</b>	<b>245.2</b>	<b>251.3</b>	<b>245.3</b>	<b>278.7</b>
Annual Operation and Maintenance		15.8	17.3	19.0	19.3	19.1	20.6
Annual Revenue (2007)	Case 1 (=Rp. 4,000)	360	440	680	760	1,010	1,160
	Case 2 (=Rp. 8,000)	690	830	1,280	1,430	1,880	2,170
	Case 3 (=Rp.12,000)	960	1,170	1,760	1,980	2,590	3,010
	Case 4 (=Rp.16,000)	1,180	1,430	2,130	2,390	3,110	3,640
	Case 5 (=Rp.20,000)	1,330	1,620	2,370	2,670	3,440	4,070
Annual Revenue (2020)	Case 1 (=Rp. 4,000)	550	670	1,060	1,190	1,590	1,790
	Case 2 (=Rp. 8,000)	1,060	1,310	2,050	2,300	3,070	3,460
	Case 3 (=Rp.12,000)	1,530	1,880	2,940	3,290	4,400	4,960
	Case 4 (=Rp.16,000)	1,930	2,380	3,700	4,140	5,540	6,250
	Case 5 (=Rp.20,000)	2,270	2,800	4,330	4,850	6,480	7,320



**Table 3.8.18 Detailed Camera-Surveillance Cost Breakdown for Alternative 1**

	Unit	Quantity	Unit Price		Amount		Total (thousand)	Total (million Rp.)	
			thousand Yen	thousand Rp.	thousand Yen	thousand Rp.			
<b>1. Control Center System</b>									
Monitoring and control server	set	2	50,000		100,000	0	100,000	7,792	
Database server	set	2	40,000		80,000	0	80,000	6,234	
Application server	set	2	30,000		60,000	0	60,000	4,675	
LAN equipment	LS	1	5,000		5,000	0	5,000	390	
Communication control unit	set	1	15,000		15,000	0	15,000	1,169	
Monitoring & control software	LS	1	150,000		150,000	0	150,000	11,689	
Application software	LS	1	200,000		200,000	0	200,000	15,585	
Database software	LS	1	10,000		10,000	0	10,000	779	
Database data	LS	1		1,000,000	0	1,000,000	12,833	1,000	
Control center building	m2	500		20,000	0	10,000,000	128,329	10,000	
Control center facilities	LS	1	15,000	500,000	15,000	500,000	21,416	1,669	
Office facilities	LS	1		200,000	0	200,000	2,567	200	
Sub-total					635,000	11,700,000	785,145	61,182	
<b>2. Outstation Equipment</b>									
Outstation Computer	no.	34	5,000		170,000	0	170,000	13,247	
Control software	LS	1	120,000		120,000	0	120,000	9,351	
TV camera and image processor	no.	77	8,000		616,000	0	616,000	48,001	
Gate structure	no.	34	3,000	10,000	102,000	340,000	106,363	8,288	
Power supply, etc.	no.	34		20,000	0	680,000	8,726	680	
Sub-total					1,008,000	1,020,000	1,021,089	79,567	
<b>Total Construction Cost</b>					<b>1,643,000</b>	<b>12,720,000</b>	<b>1,806,234</b>	<b>140,749</b>	
<b>5. Technical Assistance</b>									
<b>5.1 Design</b>									
Foreign consultant	M/M	72	3,000		216,000	0	216,000	16,832	
Local consultant	M/M	108		10,000	0	1,080,000	13,860	1,080	
Office expense	month	18		80,000	0	1,440,000	18,479	1,440	
<b>5.2 Construction Supervision</b>									
Foreign consultant	M/M	54	3,000		162,000	0	162,000	12,624	
Local consultant	M/M	108		10,000	0	1,080,000	13,860	1,080	
Office expense	month	18		80,000	0	1,440,000	18,479	1,440	
Sub-total					378,000	5,040,000	442,678	34,496	
Contingency (10% of construction cost)						164,300	1,272,000	180,624	14,075
VAT (10% on construction cost)						164,300	1,272,000	180,624	14,075
<b>Total Project Cost (incl. construction)</b>						<b>2,349,600</b>	<b>20,304,000</b>	<b>2,610,160</b>	<b>203,395</b>
<b>6. Annual Operation and Maintenance</b>									
Operation and management staff	person	30		60,000	0	1,800,000	23,099	1,800	
Office, transportation, etc.	LS	1		1,500,000	0	1,500,000	19,249	1,500	
Electricity, communication, etc.	LS	1		1,000,000	0	1,000,000	12,833	1,000	
Leased line	no.	34		50,000	0	1,700,000	21,816	1,700	
Spare parts	LS	1	49,290		49,290	0	49,290	3,841	
Maintenance contract	LS	1		6,000,000	0	6,000,000	76,998	6,000	
<b>Annual O/M Cost</b>						<b>49,290</b>	<b>12,000,000</b>	<b>203,285</b>	<b>15,841</b>

**Assumptions:**

Number of Gantry and Lanes	Gate	Lane
1-lane type	9	9
2-lane type	12	24
3-lane type	8	24
4-lane type	5	20
5-lane type		0
Total	34	77

**Table 3.8.19 Detailed Camera-Surveillance Cost Breakdown for Alternative 2**

	Unit	Quantity	Unit Price		Amount		Total (thousand)	Total (million Rp.)
			thousand Yen	thousand Rp.	thousand Yen	thousand Rp.		
<b>1. Control Center System</b>								
Monitoring and control server	set	2	50,000		100,000	0	100,000	7,792
Database server	set	2	40,000		80,000	0	80,000	6,234
Application server	set	2	30,000		60,000	0	60,000	4,675
LAN equipment	LS	1	5,000		5,000	0	5,000	390
Communication control unit	set	1	15,000		15,000	0	15,000	1,169
Monitoring & control software	LS	1	150,000		150,000	0	150,000	11,689
Application software	LS	1	200,000		200,000	0	200,000	15,585
Database software	LS	1	10,000		10,000	0	10,000	779
Database data	LS	1		1,000,000	0	1,000,000	12,833	1,000
Control center building	m2	500		20,000	0	10,000,000	128,329	10,000
Control center facilities	LS	1	15,000	500,000	15,000	500,000	21,416	1,669
Office facilities	LS	1		200,000	0	200,000	2,567	200
Sub-total					635,000	11,700,000	785,145	61,182
<b>2. Outstation Equipment</b>								
Outstation Computer	no.	37	5,000		185,000	0	185,000	14,416
Control software	LS	1	120,000		120,000	0	120,000	9,351
TV camera and image processor	no.	82	8,000		656,000	0	656,000	51,118
Gate structure	no.	37	3,000	10,000	111,000	370,000	115,748	9,020
Power supply, etc.	no.	37		20,000	0	740,000	9,496	740
Sub-total					1,072,000	1,110,000	1,086,244	84,645
<b>Total Construction Cost</b>					<b>1,707,000</b>	<b>12,810,000</b>	<b>1,871,389</b>	<b>145,827</b>
<b>5. Technical Assistance</b>								
<b>5.1 Design</b>								
Foreign consultant	M/M	72	3,000		216,000	0	216,000	16,832
Local consultant	M/M	108		10,000	0	1,080,000	13,860	1,080
Office expense	month	18		80,000	0	1,440,000	18,479	1,440
<b>5.2 Construction Supervision</b>								
Foreign consultant	M/M	54	3,000		162,000	0	162,000	12,624
Local consultant	M/M	108		10,000	0	1,080,000	13,860	1,080
Office expense	month	18		80,000	0	1,440,000	18,479	1,440
Sub-total					378,000	5,040,000	442,678	34,496
Contingency (10% of construction cost)					170,700	1,281,000	187,139	14,583
VAT (10% on construction cost)					170,700	1,281,000	187,139	14,583
<b>Total Project Cost (incl. construction)</b>					<b>2,426,400</b>	<b>20,412,000</b>	<b>2,688,345</b>	<b>209,489</b>
<b>6. Annual Operation and Maintenance</b>								
Operation and management staff	person	50		60,000	0	3,000,000	38,499	3,000
Office, transportation, etc.	LS	1		1,500,000	0	1,500,000	19,249	1,500
Electricity, communication, etc.	LS	1		1,000,000	0	1,000,000	12,833	1,000
Leased line	no.	37		50,000	0	1,850,000	23,741	1,850
Spare parts	LS	1	51,210		51,210	0	51,210	3,991
Maintenance contract	LS	1		6,000,000	0	6,000,000	76,998	6,000
<b>Annual O/M Cost</b>					<b>51,210</b>	<b>13,350,000</b>	<b>222,530</b>	<b>17,341</b>

**Assumptions:**

Number of Gantry and Lanes	Gate	Lane
1-lane type	10	10
2-lane type	13	26
3-lane type	10	30
4-lane type	4	16
5-lane type		0
Total	37	82

**Table 3.8.20 Detailed Camera-Surveillance Cost Breakdown for Alternative 3**

	Unit	Quantity	Unit Price		Amount		Total (thousand)	Total (million Rp.)	
			thousand Yen	thousand Rp.	thousand Yen	thousand Rp.			
<b>1. Control Center System</b>									
Monitoring and control server	set	2	50,000		100,000	0	100,000	7,792	
Database server	set	2	40,000		80,000	0	80,000	6,234	
Application server	set	2	30,000		60,000	0	60,000	4,675	
LAN equipment	LS	1	5,000		5,000	0	5,000	390	
Communication control unit	set	1	15,000		15,000	0	15,000	1,169	
Monitoring & control software	LS	1	150,000		150,000	0	150,000	11,689	
Application software	LS	1	200,000		200,000	0	200,000	15,585	
Database software	LS	1	10,000		10,000	0	10,000	779	
Database data	LS	1		1,000,000	0	1,000,000	12,833	1,000	
Control center building	m2	500		20,000	0	10,000,000	128,329	10,000	
Control center facilities	LS	1	15,000	500,000	15,000	500,000	21,416	1,669	
Office facilities	LS	1		200,000	0	200,000	2,567	200	
Sub-total					635,000	11,700,000	785,145	61,182	
<b>2. Outstation Equipment</b>									
Outstation Computer	no.	52	5,000		260,000	0	260,000	20,260	
Control software	LS	1	120,000		120,000	0	120,000	9,351	
TV camera and image processor	no.	114	8,000		912,000	0	912,000	71,067	
Gate structure	no.	52	3,000	10,000	156,000	520,000	162,673	12,676	
Power supply, etc.	no.	52		20,000	0	1,040,000	13,346	1,040	
Sub-total					1,448,000	1,560,000	1,468,019	114,394	
<b>Total Construction Cost</b>					<b>2,083,000</b>	<b>13,260,000</b>	<b>2,253,164</b>	<b>175,576</b>	
<b>5. Technical Assistance</b>									
<b>5.1 Design</b>									
Foreign consultant	M/M	72	3,000		216,000	0	216,000	16,832	
Local consultant	M/M	108		10,000	0	1,080,000	13,860	1,080	
Office expense	month	18		80,000	0	1,440,000	18,479	1,440	
<b>5.2 Construction Supervision</b>									
Foreign consultant	M/M	54	3,000		162,000	0	162,000	12,624	
Local consultant	M/M	108		10,000	0	1,080,000	13,860	1,080	
Office expense	month	18		80,000	0	1,440,000	18,479	1,440	
Sub-total					378,000	5,040,000	442,678	34,496	
Contingency (10% of construction cost)						208,300	1,326,000	225,316	17,558
VAT (10% on construction cost)						208,300	1,326,000	225,316	17,558
<b>Total Project Cost (incl. construction)</b>						<b>2,877,600</b>	<b>20,952,000</b>	<b>3,146,474</b>	<b>245,188</b>
<b>6. Annual Operation and Maintenance</b>									
Operation and management staff	person	50		60,000	0	3,000,000	38,499	3,000	
Office, transportation, etc.	LS	1		1,500,000	0	1,500,000	19,249	1,500	
Electricity, communication, etc.	LS	1		1,000,000	0	1,000,000	12,833	1,000	
Leased line	no.	52		50,000	0	2,600,000	33,366	2,600	
Spare parts	LS	1	62,490		62,490	0	62,490	4,869	
Maintenance contract	LS	1		6,000,000	0	6,000,000	76,998	6,000	
<b>Annual O/M Cost</b>						<b>62,490</b>	<b>14,100,000</b>	<b>243,435</b>	<b>18,969</b>

**Assumptions:**

Number of Gantry and Lanes	Gate	Lane
1-lane type	15	15
2-lane type	20	40
3-lane type	10	30
4-lane type	6	24
5-lane type	1	5
Total	52	114

**Table 3.8.21 Detailed Camera-Surveillance Cost Breakdown for Alternative 4**

	Unit	Quantity	Unit Price		Amount		Total (thousand)	Total (million Rp.)	
			thousand Yen	thousand Rp.	thousand Yen	thousand Rp.			
<b>1. Control Center System</b>									
Monitoring and control server	set	2	50,000		100,000	0	100,000	7,792	
Database server	set	2	40,000		80,000	0	80,000	6,234	
Application server	set	2	30,000		60,000	0	60,000	4,675	
LAN equipment	LS	1	5,000		5,000	0	5,000	390	
Communication control unit	set	1	15,000		15,000	0	15,000	1,169	
Monitoring & control software	LS	1	150,000		150,000	0	150,000	11,689	
Application software	LS	1	200,000		200,000	0	200,000	15,585	
Database software	LS	1	10,000		10,000	0	10,000	779	
Database data	LS	1		1,000,000	0	1,000,000	12,833	1,000	
Control center building	m2	500		20,000	0	10,000,000	128,329	10,000	
Control center facilities	LS	1	15,000	500,000	15,000	500,000	21,416	1,669	
Office facilities	LS	1		200,000	0	200,000	2,567	200	
<b>Sub-total</b>					<b>635,000</b>	<b>11,700,000</b>	<b>785,145</b>	<b>61,182</b>	
<b>2. Outstation Equipment</b>									
Outstation Computer	no.	55	5,000		275,000	0	275,000	21,429	
Control software	LS	1	120,000		120,000	0	120,000	9,351	
TV camera and image processor	no.	119	8,000		952,000	0	952,000	74,184	
Gate structure	no.	55	3,000	10,000	165,000	550,000	172,058	13,408	
Power supply, etc.	no.	55		20,000	0	1,100,000	14,116	1,100	
<b>Sub-total</b>					<b>1,512,000</b>	<b>1,650,000</b>	<b>1,533,174</b>	<b>119,472</b>	
<b>Total Construction Cost</b>					<b>2,147,000</b>	<b>13,350,000</b>	<b>2,318,319</b>	<b>180,654</b>	
<b>5. Technical Assistance</b>									
<b>5.1 Design</b>									
Foreign consultant	M/M	72	3,000		216,000	0	216,000	16,832	
Local consultant	M/M	108		10,000	0	1,080,000	13,860	1,080	
Office expense	month	18		80,000	0	1,440,000	18,479	1,440	
<b>5.2 Construction Supervision</b>									
Foreign consultant	M/M	54	3,000		162,000	0	162,000	12,624	
Local consultant	M/M	108		10,000	0	1,080,000	13,860	1,080	
Office expense	month	18		80,000	0	1,440,000	18,479	1,440	
<b>Sub-total</b>					<b>378,000</b>	<b>5,040,000</b>	<b>442,678</b>	<b>34,496</b>	
Contingency (10% of construction cost)						214,700	1,335,000	231,832	18,065
VAT (10% on construction cost)						214,700	1,335,000	231,832	18,065
<b>Total Project Cost (incl. construction)</b>						<b>2,954,400</b>	<b>21,060,000</b>	<b>3,224,661</b>	<b>251,280</b>
<b>6. Annual Operation and Maintenance</b>									
Operation and management staff	person	50		60,000	0	3,000,000	38,499	3,000	
Office, transportation, etc.	LS	1		1,500,000	0	1,500,000	19,249	1,500	
Electricity, communication, etc.	LS	1		1,000,000	0	1,000,000	12,833	1,000	
Leased line	no.	55		50,000	0	2,750,000	35,291	2,750	
Spare parts	LS	1	64,410		64,410	0	64,410	5,019	
Maintenance contract	LS	1		6,000,000	0	6,000,000	76,998	6,000	
<b>Annual O/M Cost</b>					<b>64,410</b>	<b>14,250,000</b>	<b>247,280</b>	<b>19,269</b>	

**Assumptions:**

Number of Gantry and Lanes	Gate	Lane
1-lane type	16	16
2-lane type	21	42
3-lane type	12	36
4-lane type	5	20
5-lane type	1	5
<b>Total</b>	<b>55</b>	<b>119</b>

**Table 3.8.22 Detailed Camera-Surveillance Cost Breakdown for Alternative 5**

	Unit	Quantity	Unit Price		Amount		Total (thousand)	Total (million Rp.)
			thousand Yen	thousand Rp.	thousand Yen	thousand Rp.		
<b>1. Control Center System</b>								
Monitoring and control server	set	2	50,000		100,000	0	100,000	7,792
Database server	set	2	40,000		80,000	0	80,000	6,234
Application server	set	2	30,000		60,000	0	60,000	4,675
LAN equipment	LS	1	5,000		5,000	0	5,000	390
Communication control unit	set	1	15,000		15,000	0	15,000	1,169
Monitoring & control software	LS	1	150,000		150,000	0	150,000	11,689
Application software	LS	1	200,000		200,000	0	200,000	15,585
Database software	LS	1	10,000		10,000	0	10,000	779
Database data	LS	1		1,000,000	0	1,000,000	12,833	1,000
Control center building	m2	500		20,000	0	10,000,000	128,329	10,000
Control center facilities	LS	1	15,000	500,000	15,000	500,000	21,416	1,669
Office facilities	LS	1		200,000	0	200,000	2,567	200
Sub-total					635,000	11,700,000	785,145	61,182
<b>2. Outstation Equipment</b>								
Outstation Computer	no.	54	5,000		270,000	0	270,000	21,040
Control software	LS	1	120,000		120,000	0	120,000	9,351
TV camera and image processor	no.	112	8,000		896,000	0	896,000	69,820
Gate structure	no.	54	3,000	10,000	162,000	540,000	168,930	13,164
Power supply, etc.	no.	54		20,000	0	1,080,000	13,860	1,080
Sub-total					1,448,000	1,620,000	1,468,790	114,455
<b>Total Construction Cost</b>					<b>2,083,000</b>	<b>13,320,000</b>	<b>2,253,935</b>	<b>175,637</b>
<b>5. Technical Assistance</b>								
<b>5.1 Design</b>								
Foreign consultant	M/M	72	3,000		216,000	0	216,000	16,832
Local consultant	M/M	108		10,000	0	1,080,000	13,860	1,080
Office expense	month	18		80,000	0	1,440,000	18,479	1,440
<b>5.2 Construction Supervision</b>								
Foreign consultant	M/M	54	3,000		162,000	0	162,000	12,624
Local consultant	M/M	108		10,000	0	1,080,000	13,860	1,080
Office expense	month	18		80,000	0	1,440,000	18,479	1,440
Sub-total					378,000	5,040,000	442,678	34,496
Contingency (10% of construction cost)					208,300	1,332,000	225,393	17,564
VAT (10% on construction cost)					208,300	1,332,000	225,393	17,564
<b>Total Project Cost (incl. construction)</b>					<b>2,877,600</b>	<b>21,024,000</b>	<b>3,147,399</b>	<b>245,261</b>
<b>6. Annual Operation and Maintenance</b>								
Operation and management staff	person	50		60,000	0	3,000,000	38,499	3,000
Office, transportation, etc.	LS	1		1,500,000	0	1,500,000	19,249	1,500
Electricity, communication, etc.	LS	1		1,000,000	0	1,000,000	12,833	1,000
Leased line	no.	54		50,000	0	2,700,000	34,649	2,700
Spare parts	LS	1	62,490		62,490	0	62,490	4,869
Maintenance contract	LS	1		6,000,000	0	6,000,000	76,998	6,000
<b>Annual O/M Cost</b>					<b>62,490</b>	<b>14,200,000</b>	<b>244,718</b>	<b>19,069</b>

**Assumptions:**

Number of Gantry and Lanes	Gate	Lane
1-lane type	21	21
2-lane type	19	38
3-lane type	6	18
4-lane type	5	20
5-lane type	3	15
Total	54	112

**Table 3.8.23 Detailed Camera-Surveillance Cost Breakdown for Alternative 6**

	Unit	Quantity	Unit Price		Amount		Total (thousand)	Total (million Rp.)	
			thousand Yen	thousand Rp.	thousand Yen	thousand Rp.			
<b>1. Control Center System</b>									
Monitoring and control server	set	2	50,000		100,000	0	100,000	7,792	
Database server	set	2	40,000		80,000	0	80,000	6,234	
Application server	set	2	30,000		60,000	0	60,000	4,675	
LAN equipment	LS	1	5,000		5,000	0	5,000	390	
Communication control unit	set	1	15,000		15,000	0	15,000	1,169	
Monitoring & control software	LS	1	150,000		150,000	0	150,000	11,689	
Application software	LS	1	200,000		200,000	0	200,000	15,585	
Database software	LS	1	10,000		10,000	0	10,000	779	
Database data	LS	1		1,000,000	0	1,000,000	12,833	1,000	
Control center building	m2	500		20,000	0	10,000,000	128,329	10,000	
Control center facilities	LS	1	15,000	500,000	15,000	500,000	21,416	1,669	
Office facilities	LS	1		200,000	0	200,000	2,567	200	
Sub-total					635,000	11,700,000	785,145	61,182	
<b>2. Outstation Equipment</b>									
Outstation Computer	no.	69	5,000		345,000	0	345,000	26,884	
Control software	LS	1	120,000		120,000	0	120,000	9,351	
TV camera and image processor	no.	141	8,000		1,128,000	0	1,128,000	87,899	
Gate structure	no.	69	3,000	10,000	207,000	690,000	215,855	16,820	
Power supply, etc.	no.	69		20,000	0	1,380,000	17,709	1,380	
Sub-total					1,800,000	2,070,000	1,826,564	142,334	
<b>Total Construction Cost</b>					<b>2,435,000</b>	<b>13,770,000</b>	<b>2,611,709</b>	<b>203,516</b>	
<b>5. Technical Assistance</b>									
<b>5.1 Design</b>									
Foreign consultant	M/M	72	3,000		216,000	0	216,000	16,832	
Local consultant	M/M	108		10,000	0	1,080,000	13,860	1,080	
Office expense	month	18		80,000	0	1,440,000	18,479	1,440	
<b>5.2 Construction Supervision</b>									
Foreign consultant	M/M	54	3,000		162,000	0	162,000	12,624	
Local consultant	M/M	108		10,000	0	1,080,000	13,860	1,080	
Office expense	month	18		80,000	0	1,440,000	18,479	1,440	
Sub-total					378,000	5,040,000	442,678	34,496	
Contingency (10% of construction cost)						243,500	1,377,000	261,171	20,352
VAT (10% on construction cost)						243,500	1,377,000	261,171	20,352
<b>Total Project Cost (incl. construction)</b>					<b>3,300,000</b>	<b>21,564,000</b>	<b>3,576,729</b>	<b>278,716</b>	
<b>6. Annual Operation and Maintenance</b>									
Operation and management staff	person	50		60,000	0	3,000,000	38,499	3,000	
Office, transportation, etc.	LS	1		1,500,000	0	1,500,000	19,249	1,500	
Electricity, communication, etc.	LS	1		1,000,000	0	1,000,000	12,833	1,000	
Leased line	no.	69		50,000	0	3,450,000	44,274	3,450	
Spare parts	LS	1	73,050		73,050	0	73,050	5,692	
Maintenance contract	LS	1		6,000,000	0	6,000,000	76,998	6,000	
<b>Annual O/M Cost</b>					<b>73,050</b>	<b>14,950,000</b>	<b>264,903</b>	<b>20,642</b>	

**Assumptions:**

Number of Gantry and Lanes	Gate	Lane
1-lane type	24	24
2-lane type	27	54
3-lane type	10	30
4-lane type	7	28
5-lane type	1	5
Total	69	141

### 3.9 ALTERNATIVE IMPLEMENTATION SCHEMES

Components of the TDM project implementation are divided into the following major activities:

- TDM facility installation (TDM toll collection system, inspection system, traffic monitoring system, etc.);
- TDM operation and management (TDM toll fee collection and revenue distribution);
- TDM inspection (control and regulation over violators); and,
- TDM monitoring (traffic monitoring, public hearing, etc.).

Each of the above activities can be conducted both by public and private sectors. Thus, it will be possible to apply a “Public-Private Partnership” scheme in applying TDM. Table 3.9.1 shows possible combination of the public and private sectors, and Table 3.9.2 shows revenues and costs for each combination of the implementation body.

**Table 3.9.1 Alternatives for Project Implementation Body**

	Installation	Operation	Inspection	Monitoring	Type
Scheme 1	JTA	JTA	JTA	JTA	Public
Scheme 2	JTA	Private	JTA	JTA	Contract Out
Scheme 3	Private	Private	Police	JTA	Concession
Scheme 4	Private	Private	Private	JTA	Concession

**Table 3.9.2 Cost and Revenue**

	Public		Private	
	Revenue	Cost	Revenue	Cost
Scheme 1	All of TDM Revenue	Installation cost O&M Inspection Monitoring	None	None
Scheme 2	All of TDM Revenue	Installation cost Cost for contracting out Inspection cost Monitoring cost	Contract fee	O&M
Scheme 3	Part of TDM Revenue	Monitoring cost (DKI) Inspection cost (Police)	Part of TDM Revenue	Installation cost O&M
Scheme 4	Part of TDM Revenue	Monitoring cost (DKI)	Part of TDM Revenue	Installation cost O&M Inspection

For establishment of an ERP system in the long term, it is preferable to have the private sector take the main role for the project as it involves a high order of communication technology. In this sense, Scheme 3 or Scheme 4 may be adopted.

On the other hand, when applying a parking pricing scheme in the proposed area, Scheme 2 or Scheme 3 might be easily applied because the parking lots and parking charging facilities have been prepared by the private sector in Jabodetabek.

### **3.10 LEGISLATIVE PROVISIONS**

In terms of government legislation that allows for the introduction of TDM, it is necessary to stipulate restricted areas and hours, target vehicle types, toll fees, and so on. On the other hand, it is also important to leave enough flexibility in order to be able to modify the contents of stipulations later when traffic situations or land use patterns have changed. Furthermore, as to the implementation body and the implementation itself, the following provisions have to be contained in the legislation.

- Jabodetabek Transportation Authority (JTA) can introduce TDM levying schemes to tackle the traffic congestion problems in the CBD.
- JTA can only introduce a TDM levying scheme if it helps to meet the priorities identified in the JTA's and local authorities' transportation plans and considers the specific local circumstances.
- No scheme should proceed unless and until it has been shown to be justified in terms of costs and benefits, with reference to the specific proposals for charge levels and scheme design for that scheme.
- All schemes will need to be consulted within the communities and among the stakeholders, allowing those representing particular interest groups to consider the proposals.
- With different levels of congestion charging powers, new TDM methods to control traffic demand can be provided.
- Implementation of these TDM methods can generate a source of new, stable funding for transportation improvements in Jabodetabek.

Finally, for institutionalization of TDM, not only is it necessary to prepare sufficient documents for explanation of TDM in the Parliament, but it is also necessary to spend enough time on socialization in order to have a general consensus of necessity of TDM, for example, through public hearings or campaigns.



## **3.11 IMPLEMENTATION PLAN**

### **3.11.1 Lessons from 3-in-1 Regulation**

As mentioned in the previous section, the new 3-in-1 regulation has been extended and enforced since January 2004. The most conspicuous point is that vehicle users are obliged to have three fellow passengers or more for every ride including the driver to pass through any section of the designated routes covered by the regulation. Users cannot pass through the designated routes after dropping their wives and children at office or school if the fellow passengers are reduced to one or two.

Many people are now having problems with this regulation. For instance, if car users have to carry several pieces of luggage regardless of personal belongings or business use, they cannot change to public transportation. The only way to avoid 3-in-1 is to change the time to pass through the restricted routes. Truck drivers are also facing difficulties because they cannot change the mode of transport to another, while many are usually driving trucks alone with no fellow passengers.

Considering these circumstances, it is necessary to prepare an “escape” in advance and allow scope for choice of alternatives in some way or other, such as shifting to other modes of transport or paying the levy toll. Along with the new 3-in-1 regulation, DKI Jakarta has initiated the busway on almost the same route. It is obvious that the public transportation, however, cannot function as a complete option to avoid 3-in-1 in some cases.

### **3.11.2 Implementation Plan**

#### **(1) Basic Policy of Implementation Plan**

##### **1) Objective**

The first objective is to reduce the current vehicular traffic generated from and attracted into the central area of DKI Jakarta as much as possible so that at least the current level of congestion can be maintained even in the future.

##### **2) Implication of the Plan**

The currently adopted strict enforcement of the 3-in-1 regulation revealed the importance of monitoring. In terms of TDM, it is easily supposed that the best alternative measures cannot be found from the beginning. Important thing about TDM is to modify and revise the plan through the monitoring process to meet the initial objective and to balance the effectiveness with the social impacts. In this context, the following implementation plan is a preferable draft from a

viewpoint of technical evaluation at this moment and, as a matter of course, is subject to occasional change depending on future conditions.

(2) TDM Area

TDM area alternatives are roughly evaluated by effectiveness from push-out trip ratio, by social impacts from push-out trips, and by simplicity of implementation. As the implementation cost by TDM-area alternative varies greatly depending on surveillance system itself, this item is excluded from the evaluation. The results of evaluation are found in Table 3.11.1 and the following can be argued:

- Alternatives 5 and 6 should be avoided due to the huge social impacts and implementation difficulties, which are caused by the broad restricted area;
- Balance between social impacts and simplicity of implementation is a key factor to select the most preferable TDM area;
- Alternatives 3 and 4 are selected as candidates; and
- Alternative 4 was eventually selected because of inclusion of Blok M, where density of traffic generation is very high.

**Table 3.11.1 Preliminary Evaluation on TDM Area**

TDM Area	Effectiveness (pushed-out trip ratio in 2007)	Social Impacts (pushed-out trips in 2007) (1000 trips)	Simplicity of Implementation	Cost
Alternative 1	11.1%	74	Easy	Depending on conditions
Alternative 2	11.4%	92	Moderate	
Alternative 3	13.0%	156	Moderate	
Alternative 4	13.0%	174	Moderate	
Alternative 5	13.3%	223	Difficult	
Alternative 6	12.8%	248	Difficult	

Although Alternative 4 is selected as the most recommendable target area for TDM, attention has to be paid to the fact that the Kota and Kebayoran Baru areas include public transportation terminals. However, this issue can be coped with by adding intensive complementary feeder bus services to these terminal areas such as bus services from Tanjung Priok to Kota. As for Kebayoran Baru, since Kota - Blok M busway will have been extended to the south as far as Lebak Bulus in 2007, such a negative impact is expected to be smaller.

(3) Pricing Method

The following steps are desirable for realistic implementation:

- Road pricing should be take, in combination with the currently adopted 3-in-1 regulation as the first step (in 2005); and
- Area pricing will be adopted to restrain all the vehicular trips in the congested area in 2007.

It seems necessary to adopt area pricing instead of cordon pricing with a view to restraining the growing traffic in the CBD in the future, though there is not much difference in concepts between area pricing and cordon pricing.

(4) Level of Toll Levy

Taking the balance between effectiveness and social impacts into consideration, Rp. 8,000 is preferable at the first stage in order to obtain broad approval from the public. The amount of Rp. 16,000 is applicable in 2010 with a view to reducing the serious traffic congestion in CBD to the current level. And Rp. 20,000 in 2015 is set for the succeeding analysis in the study by taking social impacts into consideration, though more than Rp. 30,000 is required to reduce the congestion ratio in 2020 to the current level. This is, therefore, also subject to monitoring in the future.

(5) Surveillance System Configuration

According to the analysis in the Study, it is better to take the following steps for implementation for realistic reasons:

- Manual method should be taken initially due to its low initial investment and operation cost.
- The manual method should be switched to Electronic Road Pricing (ERP), when TDM enforcement becomes firmly established among the public. For this end, it is necessary to prepare an electronic vehicle-registration system, which enables the surveillance to trace the vehicle users by license plate in order to levy the toll and to find violation as well.

If the ERP is introduced, it is difficult to change it to the Camera Surveillance System due to duplication of investment as a whole.

(6) Target Vehicles and Other Conditions

Taking the realistic conditions into consideration, the following are drafted for implementation of TDM.

1) Target Vehicles

- Passenger cars and small trucks such as pickups are targeted.
- Large trucks should be exempted from the levy, because the routes and time for large trucks have already been regulated to avoid conflict with other ordinary vehicles.
- Motorcycles are also exempted from the levy at the first stage due to the low road occupancy in comparison with passenger cars and are subject to the results of monitoring. In other words, this shall be decided by the conditions after introduction of TDM.
- High Occupancy Vehicles (HOV) with three or more fellow passengers should be exempted at least in the first stage to comply with the current 3-in-1 regulation.
- Emergency vehicles and regular public buses should be exempted from the toll levy in any case.

2) Time Band for Regulation

- It is preferable to regulate from 7:00 until 10:00 a.m. and from 4:00 until 7:00 p.m. at the first to comply with the current 3-in-1 regulation. The time for regulation will be switched to all-day (except for nighttime) basis by 2020, if the traffic congestion is still heavy even during the daytime “off-peak” period.
- Weekdays are targeted and holidays are exempted from the regulation.

(7) Implementation Body

The following manner of implementation is preferable:

- This project should be managed by Jabodetabek Transportation Authority (JTA), which has been proposed in SITRAMP, to cover not only part of the administrative regions but the whole Jabodetabek. This is because the majority of vehicles regulated by TDM come from outside the TDM area beyond the administrative boundaries, though TDM area is located in the center of DKI Jakarta.
- Taking efficient implementation into consideration, the major components will be contracted out to private companies through bidding. Scheme 3, which has been analyzed

in the Study, is preferable as the first step because inspection work, as well as monitoring, should be done by the police for the time being at this moment.

### **3.11.3 Related Matters**

(1) Necessity of Related Transportation Facility Development

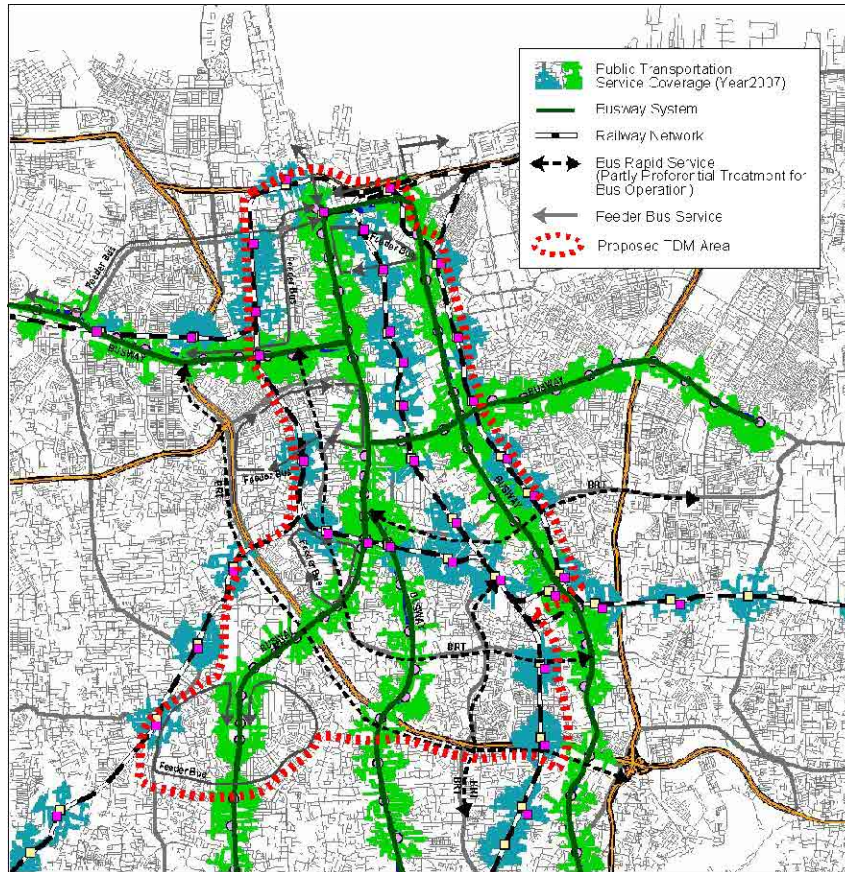
1) Short Term Development

a. Busway Development

Lessons from the current 3-in-1 revealed that provision of alternative means of transportation for the pushed-out users by TDM was of great importance to obtain public approval on TDM. One of the alternatives is public transportation development. DKI Jakarta initiated a new busway system in the middle of January 2004 between Kota and Blok M. This new system is one of the alternatives.

Area Pricing proposed in the Study is expected to launch in 2007 or thereabouts. SITRAMP has proposed four routes of busway system including extension of the current DKI Jakarta's busway system. This busway development will serve as alternatives for assumed pushed-out vehicle users.

On the other hand, feeder bus services are one of the crucial components to succeed in TDM. Some ideas have been proposed in Chapter 2 "Pre-feasibility Study on Busway Extension Project." Much attention has to be paid to rearrangement of the current bus system. In particular, areas which are inside TDM but are not well served by busway or railway should be provided with complementary feeder bus services (Figure 3.11.1).



**Figure 3.11.1 Public Transport Service Coverage and Proposed Feeder Bus Services (2007)**

b. Enforcement of Ordinary Bus Lane Regulation

Ordinary bus lanes have been installed on arterial roads of which width extends over four lanes. This system has not, however, functioned well due to lack of strong enforcement at this moment. Stronger enforcement of this bus lane regulation is necessary to comply with the current regulation. Smooth bus operation is prerequisite of the TDM.

2) Long Term Development

SITRAMP has proposed the following facility development components in the Master Plan in 2020 (related to TDM only):

- Railway development such as Serpong Line and Bekasi Line;
- Enhancement projects of the existing railway;
- New road or road widening for better access to railway stations; and
- Existing arterial-road widening to four lanes to accommodate installation of bus lanes.

These components will strengthen public transportation in Jabodetabek. It is necessary to implement the projects proposed in SITRAMP step by step in order not only to support TDM but also to establish the preferable and comprehensive future urban transportation framework.

(2) Social Impacts

As mentioned in the previous section, the social impacts have to be taken into account for implementation of the project. Especially, consideration for people in lower income bracket is inevitable because they have only limited alternatives to avoid TDM. The following activities will be necessary prior to the implementation:

- Public relations to inform the people about the TDM scheme and the plan such as objectives, time regulation, area/cordon, levy toll, fine for violence and alternatives for the pushed-out; and
- Exact information on how to use revenue accruing from the levy toll.

(3) Cost of In-Vehicle Unit

In case of ERP, all the vehicle users who want to enter the TDM area have to purchase/install an in-vehicle unit (IU), of which cost is around Rp. 1.0 million, though the manual method will still remain even after the introduction of ERP with a view to coping with an exceptional case. The cost for IU is not included in the project cost, because the cost will be borne by the users as a basic burden in order to use their vehicles in future. If users cannot afford to purchase/install the IU, they have to select an alternative means of transportation. However, it is worth considering that the government will subsidize part of the cost of IUs for faster and wider use of ERP.

## **3.12 ECONOMIC AND FINANCIAL CONSIDERATIONS**

### **3.12.1 Economic Evaluation**

(1) Assumptions

Several alternatives in terms of the restricted area of the TDM, the level of levy per trip, surveillance system and the implementation schedule of the TDM are examined. In the economic analysis the following conditions are employed as one of the alternative cases for evaluation and the efficiency of the TDM implementation is studied from the viewpoint of national economy.

- The restricted area of the TDM: Alternative 4;
- Traffic demand: The traffic demand for the levy at Rp. 8,000 per entry is used;

- The implementation schedule: Road pricing is introduced from 2005 and area pricing from 2007;
- Evaluation period: Evaluation period is until year 2020 taking into account the life period of equipment installed; and
- Surveillance system: In 2005 the manual surveillance system is introduced and is converted to the ERP system from 2010.

The cost and benefit of the TDM are compared between the scenarios of “With Project Case” and “Without Project Case”. The implementation of the SITRAMP Master Plan is regarded as “With Project Case”, while a scenario of “Without Project Case” is assumed that the TDM will not be introduced in the SITRAMP Master Plan and the projects except for the TDM will be implemented as scheduled.

(2) Changes in Trip Generation in With and Without TDM Scenarios

In the case of “Without TDM,” the vehicle total trip generation of passenger car is 1,332 thousand trips per day and 1,986 thousand per day in TDM area in 2007 and 2020, respectively. Due to the implementation of the TDM, it decreases to 1,159 thousand from 1,332 thousand in 2007 and to 1,768 thousand from 1,986 thousand in 2020. In 2007 and 2020, 13% and 11% of the total trip in the TDM area are estimated to be pushed out from trips by passenger car. The shift from the passenger car to public transportation raises the number of passenger trip of public transportation by 13% in 2007 to 16% in 2020 as shown in Table 3.12.2.

**Table 3.12.1 Vehicle Trip Generation of Passenger Car per Day “Without TDM” and “With TDM” in TDM Area**

Unit: 1,000 vehicle trips per day

Year	Income Group	Without TDM	With TDM		
		Trip Generation of Passenger Car	Trip Generation of Passenger Car	Pushed Out Trip	
2007	Low	51	19	31	61.5%
	Middle	643	556	87	13.5%
	High	638	583	55	8.7%
	Total	1,332	1,159	174	13.0%
2020	Low	4	2	3	63.2%
	Middle	358	301	57	16.0%
	High	1,624	1,465	159	9.8%
	Total	1,986	1,768	219	11.0%

Source: SITRAMP estimate



**Table 3.12.2 Number of Passenger Trip Generation of Public Transportation in TDM Area  
 “Without TDM” and “With TDM”**

Unit: 1,000 passenger trips per day

Year	Income group	Without TDM Case			With TDM Case					
		Passenger car	Public Transportation	Total	Passenger car	Public Transportation			Total	
						Original Passenger	Shift from PAX car	Total		Increase in Public Transportation
2007	Low	92	368	460	35	368	57	425	15%	460
	Middle	1,171	1,691	2,862	1,016	1,691	155	1,846	9%	2,862
	High	1,161	323	1,484	1,060	323	101	424	31%	1,484
	Total	2,424	2,382	4,806	2,111	2,382	313	2,695	13%	4,806
2020	Low	8	31	39	3	31	5	36	16%	39
	Middle	651	1,086	1,737	544	1,086	107	1,193	10%	1,737
	High	2,955	1,482	4,437	2,661	1,482	294	1,776	20%	4,437
	Total	3,614	2,599	6,213	3,208	2,599	406	3,005	16%	6,213

Source: SITRAMP estimate

### (3) Economic Impacts and Benefits

Compared with the case of without implementation of the TDM, economic impacts and benefits due to the implementation of the TDM are expected as follows:

- VOC of the passenger car in the area will reduce due to the decrease in number of traffic generation of passenger car in the area. On the other hand, there is an increase of the VOC of public transportation such as bus and railway due to the shift of traffic from passenger car to public transportation, though the increase in the cost is lower than saving cost of the VOC of the passenger car;
- Passenger car users who decide to drive in the area of TDM will enjoy a smoother drive and it will raise the efficiency of the VOC consumption of their cars as well as decrease travel time of the passengers;
- Traveling time of passengers who decide not to drive and shift to public transportation in the area may increase in the case in which alternative measures of transportation are not sufficiently provided. In the SITRAMP, therefore, busway extension, new construction of MRT, improvement of Jabotabek railway, and increase in feeder bus services are considered in the proposed TDM area; and
- The shift of passengers from private car to public transportation will generate incentives for more efficient use of capacity of public transportation system.

Among the impacts of the implementation of the TDM, Savings in Vehicle Operating Cost (VOC) and Passenger Traveling Time Cost (TTC) are regarded as tangible benefits and measured in monetary terms in order to assess the efficiency of implementation of the TDM from a viewpoint of economic analysis.

(4) Cost Estimate

The capital investment cost of the TDM amounts to Rp. 692.5 billion of which Rp. 91.8 billion and Rp. 600.7 billion are allocated for the Manual Surveillance System and the ERP System, respectively. Annual operation and maintenance cost of the two systems is also estimated as shown in Table 3.12.3. Besides the cost of the ERP system, the purchase of in-vehicle unit is required for drivers, which costs around Rp. 1.0 million per unit.

**Table 3.12.3 Cost of TDM**

	Short term period ( ~2007)	Intermediate term period (2008~2010)	Long term period (2011~2020)	Total
1) Capital Investment Cost of System (Rp. billion)				
Manual Surveillance System	91.8			91.8
ERP System		600.7		600.7
Total	91.8	600.7		692.5
2) Operation and Maintenance cost				
Manual Surveillance System	Rp. 29.3 billion per year (2005 ~ 2009)			
ERP System	Rp. 30.4 billion per year (2010 ~ 2020)			
3) In-vehicle unit				
Capital Investment Cost	Rp. 1.0 million per unit			
Operation and Maintenance Cost	Rp. 0.05 million per year per unit			

(5) Economic Evaluation

VOC of passenger cars generated in the TDM area is estimated to decrease due to the decrease of car trip with the TDM. On the other hand, additional cost will be required to provide the public transportation services for the passengers who are pushed out and shift to public transportation. The total TTC will vary according to the differences of running speed of passenger car and public transportation between the scenarios of “With TDM” and “Without TDM.”

Table 3.12.4 shows the change in travel time of passengers by income group in 2007, 2010 and 2020 for “With TDM” and “Without TDM” in the Jabodetabek. For every income group in the Jabodetabek, the passenger travel time is assumed to decrease in 2007, 2010 and 2020 with the implementation of the TDM.

**Table 3.12.4 Passenger Travel Time per Day by Income Group in Jabodetabek with TDM and without TDM**

Unit: PAX Hours per Day (1,000 hours)

Income Group	2007			2010			2020		
	PAX Hour with TDM	PAX Hour without TDM	Change in PAX Hour with TDM	PAX Hour with TDM	PAX Hour without TDM	Change in PAX Hour with TDM	PAX Hour with TDM	PAX Hour without TDM	Change in PAX Hour with TDM
High	1,730	1,750	-20	2,200	2,280	-80	6,520	6,600	-80
Middle	7,700	7,750	-50	8,210	8,700	-490	7,880	7,910	-30
Low	1,680	1,690	-10	910	1,040	-130	210	210	0
Total	11,110	11,190	-80	11,320	12,020	-700	14,610	14,720	-110

Source: SITRAMP estimate

Savings in VOC and TTC in the Jabodetabek area are prepared for the years 2007, 2010 and 2020 shown in Table 3.12.5. The savings in the VOC and TTC is estimated to amount to Rp. 390 billion, Rp. 1,750 billion and Rp. 1,380 billion in 2007, 2010 and 2020, respectively.

**Table 3.12.5 Savings in VOC and TTC in Jabodetabek “With TDM” Implementation**

Unit: Rp. billion

Year	Income group	VOC Savings	TTC Savings	Total Cost Savings
2007	High	230	90	390
	Middle		70	
	Low		0	
	Total		160	
2010	High	730	300	1,750
	Middle		660	
	Low		60	
	Total		1,020	
2020	High	1,030	310	1,380
	Middle		40	
	Low		0	
	Total		350	

Source: SITRAMP estimate

Note: Unit VOC and time value of passenger by income group are referred to Appendix of “Technical Report 10 Master Plan Evaluation” of the SITRAMP (Phase 2)

The total benefit is estimated at Rp. 6,880 billion in terms of the present value discounted at 12% during the evaluation period from 2004 to 2020. On the other hand, the cost for the investment and operation and maintenance is valued at Rp. 950 billion in the present value during the same period. The net present value (NPV) is estimated at Rp. 5,930 billion discounted at 12%. The Benefit-Cost ratio (B/C) is 7.2 discounted at 12%, which shows a high efficiency of the implementation of the TDM project from the viewpoint of national economy. The critical variable in the analysis is the value of the benefits; the savings in the VOC and TTC. In the sensitivity analysis the effect of variations in the benefits on the B/C is examined. Switching

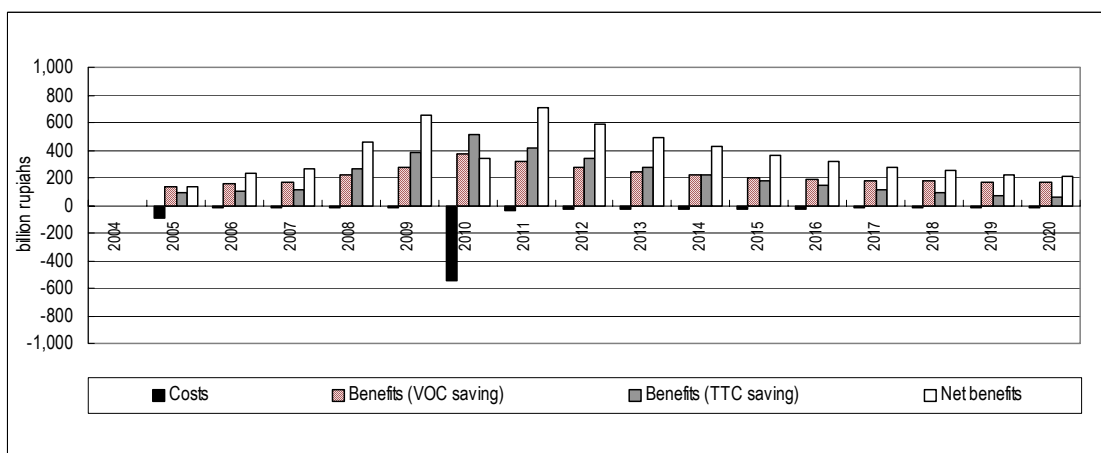
value of the decrease of the benefit is estimated at 86%, at which the B/C becomes 1.0 or the benefit equals to the cost (NPV=0).

In economic analysis, the EIRR is one of the most important indices for the judgment of economic efficiency of the project. For evaluation of the TDM Project, however, the EIRR is not employed. As a large amount of the investment cost is not required in the initial stage of the project implementation compared with the benefits generated in the initial stage, the EIRR is not a proper index to judge the viability of the TDM Project.

**Table 3.12.6 Result of Economic Evaluation**

Evaluation Index of Base Case			
Cost	Benefit	NPV	B/C
(Rp. billion in present value discounted at 12%)			
950	6,880	5,930	7.2
Sensitivity of Benefit decrease			
			B/C
Decrease of Benefit by 20%			5.8
Decrease of Benefit by 50%			3.6
Decrease of Benefit by 70%			2.2
Decrease of Benefit by 86%			1.0

Note 1): The switching value of a variable is the value at which the NPV becomes zero or the B/C becomes 1.0



**Figure 3.12.1 Benefit and Cost Flows during Evaluation Period (in Rp. billion discounted at 12%)**

### 3.12.2 Financial Evaluation

#### (1) Assumptions

Cost and revenue of the TDM is examined during the Master Plan Period until 2020 from the viewpoint of the implementing body of the TDM. The assumptions employed in the financial analysis are confirmed as follows.

- The levy is fixed at Rp. 8,000 per entry from 2005 to 2009, Rp. 16,000 from 2010 to 2014, and Rp. 20,000 from 2015 to 2020 as discussed in the previous section;
- The restricted area of the TDM is fixed to Alternative 4;
- Road pricing is introduced from 2005 and area pricing from 2007;
- In 2005 the manual surveillance system is introduced and is converted to the ERP system from 2010. The cost of the systems is allocated based on the implementation schedule;
- In-vehicle unit is basically installed by the users, however, the subsidies to the users are considered at 50% of the purchase cost. Number of in-vehicle units required is estimated based on the number of vehicle trip generation in the area;
- The TDM is scheduled to be implemented for 6 hours from 7 to 10 o'clock a.m. and from 4 to 7 o'clock p.m. Considering the 6-hour traffic ratio, 40% of the traffic generation is taken into account of the revenue estimation;
- Vehicles with 3 or more passengers (18% of the total) are excluded from the target to impose;
- Approximately a quarter of the total vehicle trip generation in the TDM area is internal traffic in the TDM area. It is assumed that the levy is also imposed on the internal traffic; and
- Excluding the internal traffic, trip generation rate is estimated to be 2.0 trips per vehicle per day.

Figure 3.12.2 shows the changes in the number of trip generation of passenger car per day in the TDM area during 2005 to 2020 under the assumptions above. Without the TDM, for example, the total number of trip generation is 1,990,000 trips per day in 2020, of which 470,000 trips will be pushed out with the TDM at Rp. 20,000 per entry. With the TDM area 1,520,000 trips are still generated per day. Out of the 1,520,000 trips, 620,000 trips (40% of the total) are the trips during the regulated hours. Excluding the trips with 3 or more passengers, 510,000 vehicle trips remain as the target to be imposed. Furthermore, the vehicles entering the area more than one time per day should be imposed only once a day. Considering every reduction factor, consequently, 310,000 vehicle trips are imposed by the TDM levy in 2020.

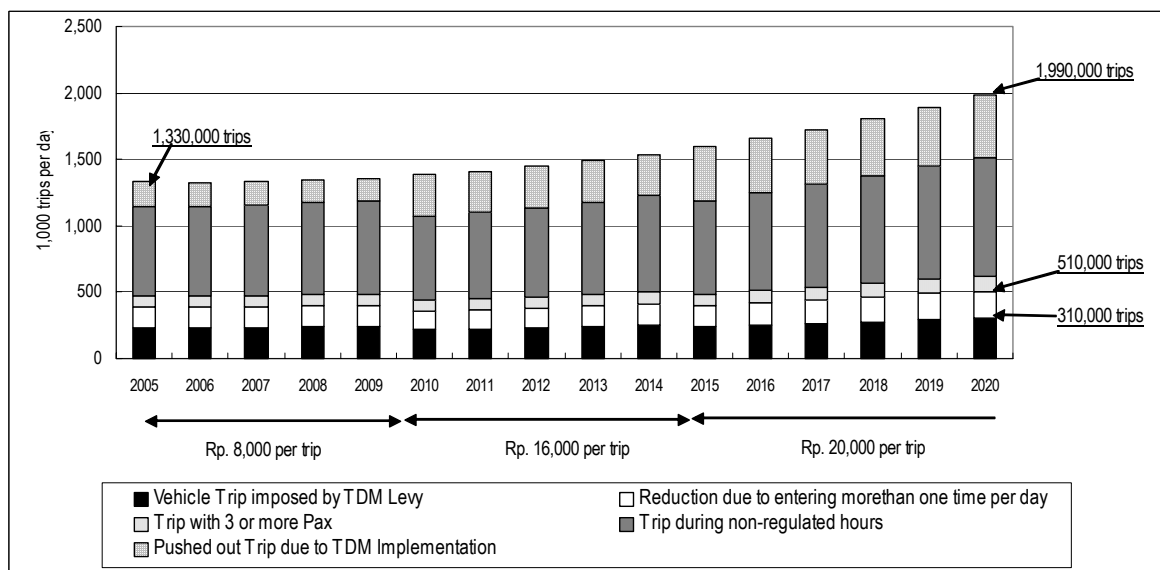


Figure 3.12.2 Trip Generation of Passenger Car in TDM Area

(2) Cost and Revenue

The cost of the TDM consists of the cost for the installation of the Manual Surveillance System in the initial stage and the ERP System from year 2010 and the subsidies to the users for the purchase of the in-vehicle unit. The total cost amounts to Rp. 1,665 billion during the Master Plan period (2004~2020).

Table 3.12.7 Cost of TDM (2005 ~ 2020)

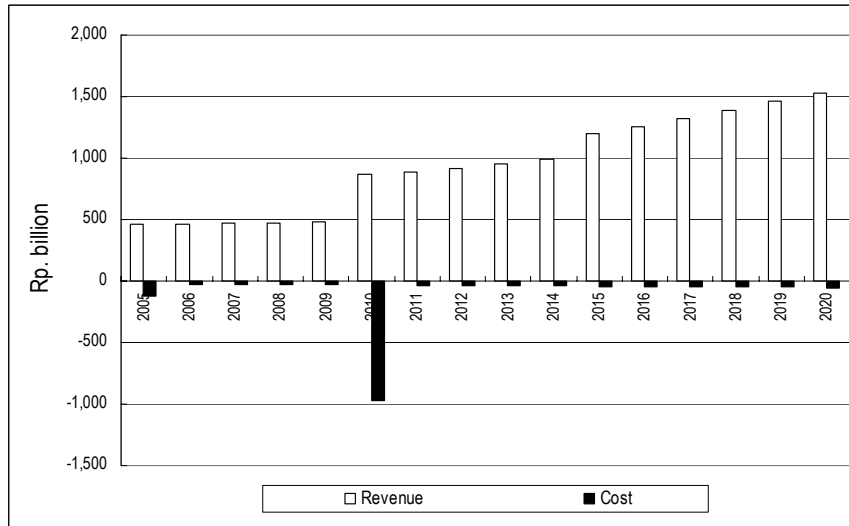
Unit: Rp. billion

	Short term Period ( ~2007)	Intermediate term Period (2008~2010)	Long term Period (2011~2020)	Total
Manual Surveillance System	92	0	0	92
ERP System	0	601	0	601
In-vehicle unit (Subsidies to users)	0	346	151	497
O & M	87	88	300	475
Total	179	1,035	451	1,665

Though there are many kinds of factors that vary the amount of the revenue from the TDM, the revenue is calculated in Table 3.12.8 under the assumptions described above. The total revenue is estimated at Rp. 15,100 billion during the Master Plan period. However, there still remains the requirement for reduction of the levy rate for the vehicles of the residents in the restricted area.

**Table 3.12.8 Revenue of TDM (2005 ~ 2020)**

Unit: Rp. billion				
	Short term Period ( ~2007)	Intermediate term Period (2008~2010)	Long term Period (2011~2020)	Total
TDM Revenue	1,400	1,800	11,900	15,100



**Figure 3.12.3 Revenue and Cost of TDM**

### 3.13 ISSUES FOR IMPLEMENTATION

TDM has to be implemented not only from the technical viewpoint but also from the political and social evaluation viewpoint. In addition, there are some uncertain conditions even on technical aspects, such as modeling in demand forecast, actual repercussions from the public after the enforcement of TDM regulation. These facts lead to the importance of monitoring the project after implementation and revealed that many components are subject to modification of plans through the monitoring. Considering these backgrounds, major issues can be summarized as follows.

1) Provision of Alternative Means of Transportation

The most important thing is that TDM scheme should be integrated with public transportation facility development. The first objective is not to prohibit vehicle traffic but to discourage the usage of vehicles. In other words, provision of other means of transportation for pushed-out people is one of the key elements of TDM. This is one of the reasons why pricing scheme was selected in association with 3-in-1 at the first step in the study.

2) Public Relations

How to balance effectiveness with social impacts and how to keep equity are the two main themes to discuss the introduction of TDM. In this context, public relations play an important

role in order to inform the public about the exact scope of the plan and to learn repercussions from the public as well.

### 3) Monitoring

As mentioned before, the monitoring after the introduction of TDM is indispensable for the better progress toward ultimate success of the project. It is not necessary to avoid criticism. On the contrary, this becomes very effective advice for the next betterment of TDM.

### 4) Equity

People in low-income bracket who are using vehicles are obliged, to some extent, to change their means of transportation or change their activities to avoid car restriction due to the toll levy. On the other hand, many people in high-income bracket may afford to pay the toll levy and continue to use vehicles. Equity has broad range of implication. If the collected money accruing from the toll levy by TDM is used for transportation facility development, the discrimination in capacity of paying the toll levy will be alleviated.

### 5) Managerial Body

As TDM brings about huge revenue, who should undertake responsibility may be a heated discussion. As mentioned in the article on Equity, it is preferable to appropriate the revenue for transportation facility development. In this context, Jabodetabek Transportation Authority, which has been proposed in SITRAMP, should manage this project and invest the revenue in major transportation facility development to cover the whole Jabodetabek beyond the current administrative boundaries.

### 6) Vehicle Registration

Lastly, current vehicle registration system has some problems in Jabodetabek. Establishment of rigid system on vehicle registration is urgent to furnish basic data to discuss transportation planning. In addition, introduction of electronic system is required to meet the IT society in the forthcoming years. That is, sooner or later, it is inevitable for Indonesia to proceed to the next era. Related officers concerning TDM have to keep this in mind.