

14. TRAFFIC DEMAND MANAGEMENT (TDM) SCHEME IN CBD

14.1 Outline of the Study

In addition to the 3-in-1 scheme which is currently in effect along the Sudirman-Thamrin corridor, other traffic demand management (TDM) measures effective in reducing congestion and acceptable to people such as road pricing, area pricing, and cordon pricing are studied from both short- (2007) and long-term (2020) points of view. Expansion of the restricted area or introduction of a new system is also considered.

14.2 Target TDM Area

Traffic restraint areas for TDM can be extended stage by stage along with the expansion of the congested area and improvement of public transport services available in restricted areas. As the first step of the project, it is preferable to introduce TDM to the existing 3-in-1 area. In this way, it is easier for TDM to be socially acceptable to the public. After it is confirmed that the system components including fee collection, sticker sales, and inspection are properly working, the area for TDM should be expanded step by step by combining some of the following alternatives. In addition, as far as conversion of the existing 3-in-1 into a road pricing system is concerned, it does not need to be scheduled in 2007 or later but can be implemented before the proposed busway system operation.

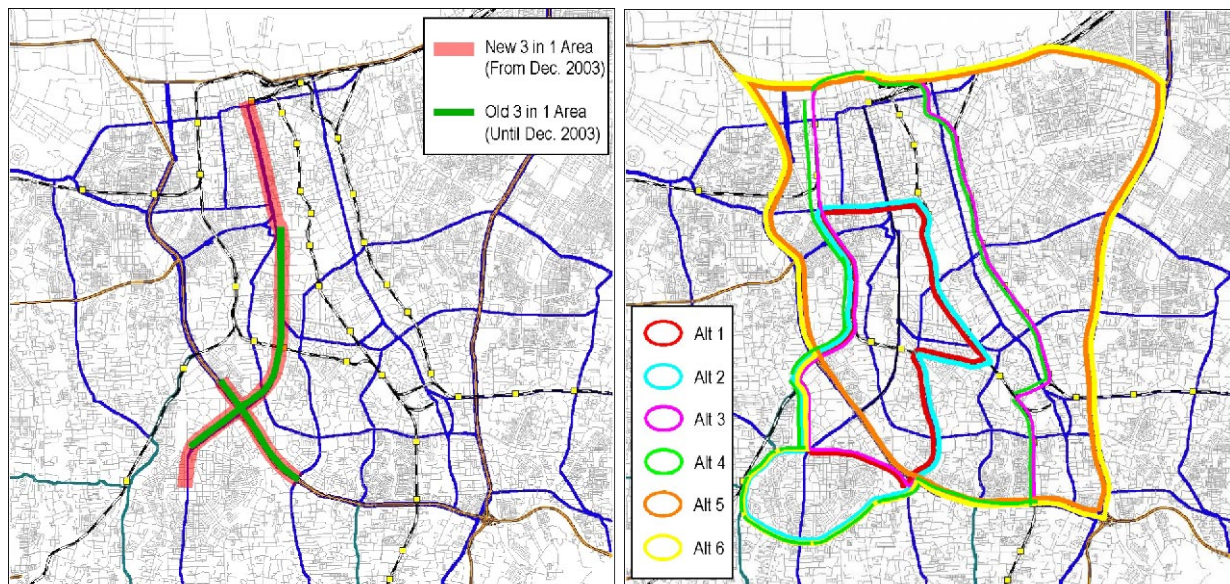


Figure 14.1 Existing 3-in-1 Area (Roads) and TDM Area Alternatives

14.3 Impact of the TDM Area Alternatives

Five cases of levy rate were tested, namely, Rp. 4,000 (Case 1), Rp. 8,000 (Case 2), Rp. 12,000 (Case 3), Rp. 16,000 (Case 4), and Rp. 20,000 (Case 5) per trip. Comparisons of percentages of those who are forced to shift from a private mode to a public mode of transportation for Alternatives 1 and 4 are shown in Figure 14.2.

Implications from those tables and figures are summarized as follows.

- Through all the alternatives, high-income people are less elastic to the increases of the toll levy by TDM, compared to the low- and middle-income people. For example, in Alternative 1 in 2007, for Case 1 (Rp. 4,000), about 6% of the high- and middle-income car users will be pushed out, and 16% of the low-income car users; whereas, for Case 5 (Rp. 20,000), about 14% of the high-income car users will be pushed out, 43% of the middle, and 99% of the low-income car users. This is because the time value for the high-income people is higher and the value of the toll in turn becomes relatively lower.

- As a total, the toll levy of TDM has a great influence on the number of pushed-out trips. Roughly speaking, in 2020 about 90% of the passenger car trip demand will still keep paying the TDM toll to drive in the restricted area in Case 2 (= Rp.8,000), while about 75% of the passenger car demand will still drive in the TDM area in Case 5 (= Rp.20,000).
- For each income group, the ratio of pushed-out trips will be higher in 2020. However, as a total, the “pushed-out” ratio will decrease from 2007 to 2020, because the majority of car users will shift to the high-income people in 2020 according to the socio-economic framework prepared for this Master Plan.

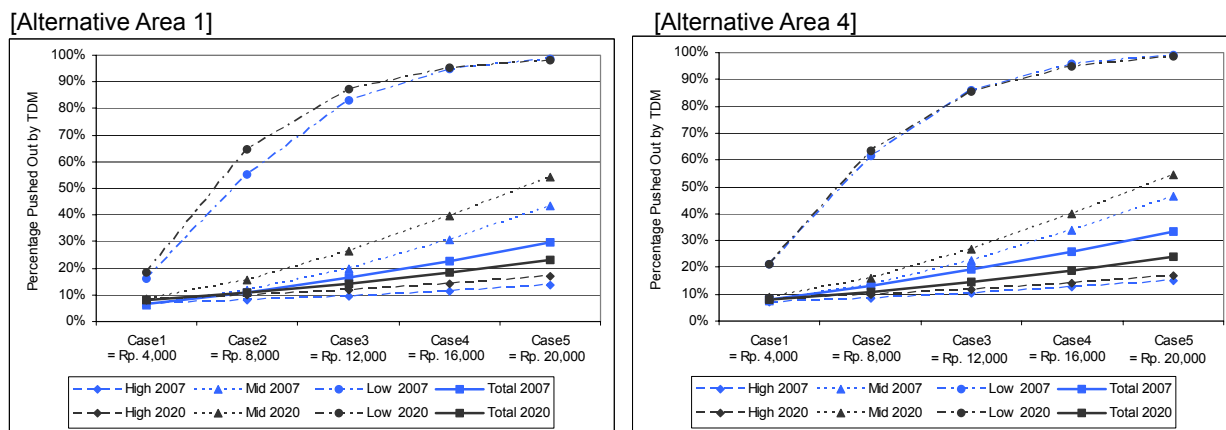


Figure 14.2 Comparison of “Pushed Out” Ratio

14.4 Pricing Methods

There are two main methods for TDM toll collection: a manual method and a mechanical method. As for the mechanical method, it is further divided into two systems: a camera-surveillance system adopted in London, and an ERP (Electronic Road Pricing) system adopted in Singapore. However, electronic database of registered vehicles has not been established yet in Jabodetabek, and therefore a camera-surveillance system cannot be adopted at present. Taking it into consideration that the cost for the mechanical system establishment is high, it is proposed to adopt the manual method in the short term and to change over to the mechanical method in the long term. Furthermore, a camera-surveillance system such as in London can also be adopted in future.

As for targets for area (or road) pricing, there are three basic ways as shown in Table 14.1.

Table 14.1 Three Basic Ways of Pricing

Road Pricing	Vehicles passing certain trunk roads (just like the existing 3-in-1 system) are charged.
Cordon Pricing	Vehicles entering the TDM area are charged.
Area Pricing	All vehicles passing the TDM area are charged.

Taking monitoring methodology and public acceptance (especially by the residents inside the TDM area) into consideration, a complete, rigid area pricing may be difficult. On the other hand, a simple cordon pricing may cause too much inequity between residents inside and outside the TDM area. Moreover, the ratio of internal (intra-TDM-area) trips to all the car trip generation in the TDM area is quite high in any area alternative or toll levy case, and it will make a big difference in traffic management as well as in revenue whether to include those internal trips or not. In this sense, a “partial” area pricing (i.e., cordon pricing, with several checkpoints on the major roads inside the TDM area as well) is more suitable in the context of Jabodetabek.

However, in Jabodetabek, it is most likely that the TDM will start as a switch from the current 3-in-1 scheme; a set of preferential HOV and road (area) pricing may be worth considering. That is, HOV vehicles with three or more passengers may be exempted from TDM toll levy while the TDM is operated through manual surveillance in the short term.

14.5 Monitoring and System Configuration

In the short term, it is recommended to first apply a manual area (or road) pricing system, because it is flexible enough to cover any road crossing the TDM area boundaries and to change the checkpoints or even the TDM area itself. Under this system, drivers need to purchase and display a paper area license or sticker, which is available at many sales outlets on the approach roads, to enter (in the case of cordon pricing) or drive in (in the case of area pricing) the TDM restricted zone. Such area licenses can be purchased on a daily or monthly basis.

Inspection officers are stationed at the gantry points (and also at any designated points in the case of area pricing) to observe whether passing vehicles display valid area licenses. Violating vehicles are pulled over and fined by the officers. After a database of registered vehicles has been established, violating vehicles will not need to be stopped but a notice of traffic offense will be sent to the driver later to pay a fine.

In the long term, a mechanical surveillance system will be adopted for TDM in place of manual surveillance. That is, an ERP system will be established, or alternatively a camera-surveillance system can be established under the condition that a vehicle registration database has been completed.

The ERP system consists of three main components: the in-vehicle unit (IU), the outstation (gantry), and the central computer system (CCS). The IU is an electronic device installed in a vehicle which accepts an IC card. The IU deducts the appropriate ERP charges from the IC card each time the vehicle passes through an ERP gantry. License plates of vehicles making illegal entries, such as those without an IU, without an IC card, or with an insufficient balance on the IC card, will be photographed by the gantry cameras for subsequent enforcement action. Charges will be levied on a one-time basis and can vary according to time and congestion levels.

14.6 Cost Estimation

Project cost of three types of surveillance system: Manual, Camera and ERP system, for each alternative of TDM area are prepared in Table 14.2. The estimated revenues by alternative TDM area are also shown in Table 14.3.

Table 14.2 Comparison 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 14.3 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

14.7 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.).

As a considerable number of vehicles come from the outside of DKI Jakarta, basic implementation and management of TDM should be undertaken by the Jabodetabek Transportation Authority (JTA). However, 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 for TDM. Table 14.4 shows possible combination of the public and private sectors, and Table 14.5 shows revenues and costs for each combination of the implementation body. For establishment of an ERP system in the long term, it is recommended 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.

Table 14.4 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 14.5 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

14.8 Legislative Provisions

In terms of legislation for implementation of TDM, it is necessary to stipulate restricted areas and hours, target vehicle types, toll fees, and so on. Furthermore, it is important to leave some flexibility in order to be able to modify the contents of stipulations later when traffic situations or land use patterns have changed. 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.

14.9 Implementation Plan

(1) Basic Policy of Implementation Plan

The main objective is to reduce the current vehicular traffic generated from and attracted into the central area of DKI Jakarta so that at least the current level of traffic situation can be maintained

even in the future.

(2) TDM Area

TDM area alternatives are roughly evaluated by effectiveness from pushed-out trip ratio, by social impacts from pushed-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. Based on the results of evaluation, 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 inclusion of too many residential areas and the limited coverage of good public transportation;
- 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 for the candidates; and
- Alternative 4 was eventually selected because of inclusion of Blok M, where density of traffic generation is very high.

Provision of alternative means of transportation for the pushed-out users by TDM is of great importance to obtain public approval on TDM. One of the alternatives is public transportation development. 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 the assumed pushed-out vehicle users.

In addition, feeder bus services are one of the crucial components to succeed in TDM. 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 14.3).

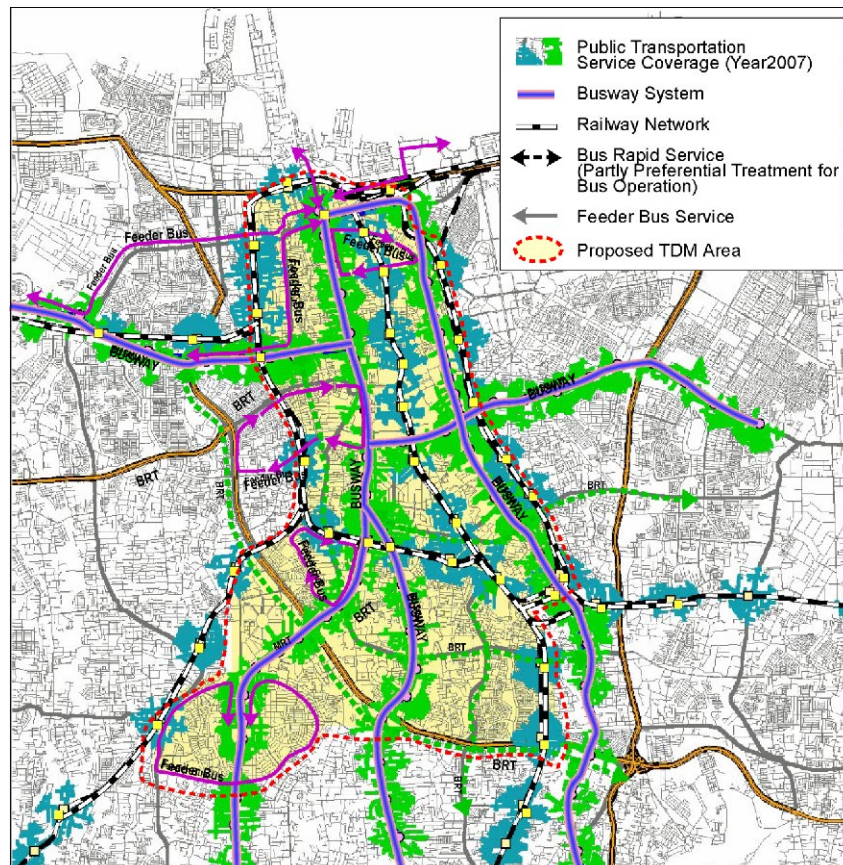


Figure 14.3 Public Transport Service Coverage and Proposed Feeder Bus Services (2007)

(3) Pricing Method

The following steps are desirable for realistic implementation:

- Road pricing should be taken, 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.

(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 the 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 flexibility and 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.

(6) Target Vehicles and Other Conditions

1) Target Vehicles

- Passenger cars (including vans and pickups) are targeted.
- Large trucks are 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 could be exempted at least in the first stage to comply with the current 3-in-1 regulation.
- Emergency vehicles, utility vehicles, and regular public buses should be immune 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 time 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. It will be easy to change the toll levy depending on the time period if the ERP system is established in the long run.
- Weekdays are targeted, and weekends and holidays are excluded from the regulation.

(7) Implementation Body

- 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 a considerable number 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 is preferable as the first step because inspection work should be done by the police for the time being at this moment.

14.10 Economic Considerations and TDM Revenue

The capital investment cost of the TDM amounts to Rp. 693 billion of which Rp. 92 billion and Rp. 601 billion are allocated for Manual Surveillance System and ERP System, respectively. Annual operation and maintenance cost of the two systems is also estimated as shown in Table 14.6. 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 14.6 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

Considering the savings in the VOC and the TTC as the benefit of the project, the B/C ratio is estimated at 7.2 using a discount rate at 12% and the ratio varies according to the decrease in the benefit generation as shown in Table 14.7.

Table 14.7 B/C Ratio and Sensitivity

	B/C (discounted at 12%)
Base Case	7.2
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

There are many uncertainties that could affect the revenue generation by the TDM. An estimate is made under the following assumptions:

- The levy is fixed at Rp. 8,000 per entry (2005 – 2009), Rp. 16,000 (2010 – 2014), and Rp. 20,000 (2015 – 2020) in the restricted area (Alternative 4); and
- Considering the factors such as the 6-hour peak traffic (40%), vehicles with 3 or more passengers (18%), and internal traffic in the TDM area (20%), the TDM levy is expected to be imposed on approximately 20% of the trip generation in the area.

Based on the assumption 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 14.8 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