

# Transport System Management Policy Towards A Sustainable Environment

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**Abstract:** The considerations I made to introduce urban road pricing schemes. The overall aim is to implement efficient instruments to reduce urban traffic. In most cases, road pricing is only one element in a more comprehensive strategy for Transport Demand Management (TDM) aimed generally at reducing total traffic volume and at promoting a shift to more environmentally friendly modes of transport. To pursue sustainable development, costs play a central role in determining transport policy. The method I will use is Transportation Demand Management (TDM). In fact, Transport Demand Management is more than just proving people are traveling; it's about the health and wellness of the community as a whole. Smart Growth is typically implemented as a set of policies and programs by state / province, regional or local governments. Their implementation often requires Policy, Institutional and Regulatory reform. By implementing road pricing and smart growth, it will have a big impact on congestion, the environment and society for the development of transportation in Indonesia. Pricing of roads is an appropriate and efficient way to impose actual road usage costs on road users

**Keywords:** Transportation, Smart growth city, Road Pricing

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## 1. Introduction

The considerations I made to introduce urban road pricing schemes. The overall aim is to implement efficient instruments to reduce urban traffic. In most cases, road pricing is only one element in a more comprehensive strategy for Transport Demand Management (TDM) aimed generally at reducing total traffic volume and at promoting a shift to more environmentally friendly modes of transport (Wang et al., 2020). To pursue sustainable development, costs play a central role in determining transport policy. Basically, two major categories of costs have to be distinguished (Langvinienė & Sližienė, 2014):

- 1) Internal costs stem from the provision (construction, maintenance) and use of transport infrastructure. These costs have to be recovered from infrastructure users or from the public. The example is infrastructure construction or maintenance (variable and fixed costs) and transport equipment construction or maintenance
- 2) External costs, on the other hand, are not part of supply or demand decisions on the transport market. They are external to these decisions. They stem from (mostly negative) side-effects of transportation, such as congestion, accidents, emissions and pollution, noise, and aesthetic factors which all negatively affect people and/or future generations. They are

rarely borne by road users. The example is congestion, accidents, emission, and noise nuisance

In many countries, the cost of internal transportation is not yet borne by road users. Transportation investments are often provided free of charge and paid for from the general budget. If state revenue from the transportation sector is lower than investment in that sector, then the transportation sector is subsidized from the general budget. Road users do not pay the full costs they cause. With proper accounting in place, internal costs may be determinable, but external costs are extremely difficult to measure (Xia & Lawson, 2013). Thus, any attempt to make road users pay exactly for the costs they cause is an illusion. Nonetheless, according to various empirical studies and experience from all over the world, external costs of transport are significant; even with high charges on vehicles, fuel, road use etc., external costs. Full Cost Recovery means securing funding for, or 'recovering', all of your costs, including the immediate costs of the project and all of your overhead. Any organization, whether voluntary, public or private, needs to recover all of its costs, and ideally generate a surplus, or be unable to pay its employees, rent office space, offer its products and services, or plan for the future and sustainable development and delivery of its services (Yanvarev et al., 2015). Funding to cover your costs can come from a variety of sources including: fees, charges, grants, contracts, donations, trading activities or payments in exchange for a particular product or service.

## **2. Method**

The method I will use is Transportation Demand Management (TDM). In fact, Transport Demand Management is more than just proving people are traveling; it's about the health and wellness of the community as a whole. As such, the field has grown to include a number of specific destinations, all of which are supported by better transportation methods. Road pricing should be integrated into broader land-use and transport development concepts. Since any road pricing scheme imposes an additional financial burden on car users, there are "winners" and "losers". The "winners" clearly include those using (the better) public transport (Kaparias et al., 2012). The car user effect is less straight forward. Some will undoubtedly benefit from reduced congestion, shorter travel times and better road quality. However, on the other hand, the increase in the cost of using individual cars may make them unable to use their car. They may have to switch to public transport, if available, and thus benefit from better public transport. The development of smart growth cities is one way to reduce the growth of congestion, as well as private transportation and can also reduce the environmental impact caused by the large number of private vehicles (Bujanová et al., 2021). Efficiency in transportation use also serves environmental purposes. With the development of smart growth cities today, transportation is contributing greatly to environmental degradation - both at

the local and global levels. At the global level, burning fossil fuels such as gasoline and diesel releases large amounts of carbon dioxide which is the main source of global warming. Increasing the price of fossil fuels reduces their use and offers incentives to introduce more fuel- efficient engines or new types of fuels. At the local level, emissions of sulfur oxides, nitrogen oxides, hydrocarbons, carbon monoxide, volatile organic compounds (VOCS) and particulates are largely responsible for health impacts such as respiratory disease or even cancer(Cao, 2021).

### **3. Pricing And Management Policy**

Road Pricing means that motorists pay directly to drive on certain roads or in certain areas. Value Pricing is a marketing term that emphasizes that road pricing can directly benefit motorists through reducing congestion or improving roadways(Sunitiyoso et al., 2020).

The different types of Road Pricing are described below.

1) Road toll (Fixed fare)

Tolls are a common way to fund road and bridge improvements. Tolls are often proposed in connection with road privatization (that is, roads built by private companies and financed by tolls). Tolls are often structured to maximize revenue and success is measured in terms of the cost recovery of the project.

2) Congestion Pricing (time-variabel)

Congestion Pricing refers to variable toll roads (higher prices in congestion conditions and lower prices at less congested times and locations) which are intended to reduce traffic volume in peak periods to an optimal level. Tolls can vary based on a fixed schedule, or are dynamic, meaning that rates change depending on the level of congestion that occurs at a certain time. This can be applied when toll roads are implemented to increase revenue, or on existing roads as a demand management strategy to avoid the need to increase capacity.

3) Cordon fees

The Cordon fee is paid by motorists for driving in a certain area, usually downtown. Some maintenance fees only apply during peak periods, such as weekdays. This can be done simply by asking vehicles driving within the area to show permission, or by beeping at every entrance to the area.

4) Vehicle Usage Fee/ Distance Based fees

Distance Based fees such as mileage costs can be used to fund roads or reduce traffic impacts, including congestion, pollution and accident risk. Vehicle registration fees and fuel taxes are replaced by variable road user fees using the GPS-based Pricing Method, to reduce traffic congestion and more fairly reflect the road costs charged by each vehicle.

5) Road Space Rationing

A variation of road pricing is the allotment of peak period vehicle trips or vehicle- miles using an income-neutral credit-based system. The result is a

form of congestion pricing in which benefits go to residents rather than road owners or the government.

From the following explanation we can draw a conclusion from different categories of road pricing and its advantages and disadvantages, contained in the Table 1.

Table. 1. Summary Categories Of Road Pricing

Name	Description	Advantages	Disadvantages
Road Toll (fixed fare)	A fixed fee for driving on a particular road.	To raise revenues	Road tolls represent a greater financial burden on lower-income motorists than on higher-income motorists
Congestion pricing (time - variable)	A fee that is higher under congested conditions than uncongested conditions, intended to shift some vehicle traffic to other routes, times and modes.	To raise revenues and reduce traffic congestion.	Shift of peak hours of vehicles from on-peak to off-peak
Cordon fees	Fees charged for driving in a particular area.	To reduce congestion in major urban centers.	Pricing for roads that should have been free could divert vehicle trips to routes that were not charged a price
Distance Based fees	A vehicle use fee based on how many miles a vehicle is driven.	To raise revenues and reduce various traffic problems.	Increased fairness, reduced vehicle travel and emission reduction
Road space rationing	Revenue-neutral credits used to ration peak-period roadway capacity.	To reduce congestion on major roadways or urban centers.	Pricing for roads that should have been free could divert vehicle trips to routes that were not charged a price

A variety of methods can be used to collect transportation costs. They differ significantly in terms of costs (collection fees usually take up 10-30% of total revenue), convenience, and price adjustments (prices that can vary according to time of day, location, type of vehicle, or other factors)(Cao, 2021). The newer electronic pricing systems tend to have lower costs, better user convenience, and better price adjustments, making Street Pricing more likely. Various Pricing Methods can be used to collect fees, as follows(Hau, 2021).

- 1) Pass

Drivers must purchase admission tickets to enter certain areas (cordon), such as cities or central business districts. The pass may be specific to a certain type of vehicle or a certain time. Some systems only require entry during busy periods, such as early mornings on weekdays. Free or discounted admission can be given to residents of the area. Entrance tickets can be sold directly by government agencies or retail stores.

## 2) Toll Booths

Conventional toll roads located on highways require motorists to stop to pay with cash or tokens. Most have officers, although some have automated coin collecting systems. This tends to create high operating costs, is inconvenient for motorists, and increases traffic congestion and local air pollution. Prices may vary according to time of day and vehicle type, but toll gates are generally several miles apart so they do not reflect a good gradation in mileage (Shatanawi et al., 2021). They generally only apply to bridges, class-separated highways or guard entrances.

## 3) Electronic Tolling

Electronic toll collection refers to an automated system that measures and charges motorists. A small transponder is placed inside the vehicle, which is counted each time which is debited for each use of the road. Other systems use a "smart card" loaded with a certain dollar value which is placed on the transponder. This system protects the rider's privacy, because there is no record of when or where the vehicle was driven.

## 4) GPS-Based Pricing

GPS-based pricing can incorporate almost any pricing factor, including factors related to the driver, vehicle, time and location of the vehicle's journey. As a result, it can be the most accurate pricing system. GPS-Based Pricing raises privacy concerns, as they record the time and location of vehicle trips, although this can be overcome in system design, for example, by deleting this data from computers after costs have been calculated, and passing privacy laws that restrict access to data. The comparison of these methods can be seen in Table 2. following.

Tabel 2. The Difference From The Pricing Method

Type	Description	Advantages	Disadvantages	Applications
Pass	Motorists must purchase a pass to enter a cordoned area.	Cheap and quick to implement.	Cheap and quick to implement.	Cheap and quick to implement.
Toll Booths	Motorists stop and pay at a booth	Many are in place Moderate price adjustability	High cost Requires vehicles to stop	Major bridges, highways and cordons
Electronic Tolling	An electronic system invoices users as they pass a point in the road system	High price adjustability. User convenience.	High implementation costs. Some privacy concerns.	Any road system.
GPS - Based Pricing	GPS is used to track vehicle location. Data are automatically transmitted to a central computer that bills users.	Highest price adjustability. User convenience.	High implementation costs. Privacy concerns.	Any road system with comprehensive pricing.

By using price information, "the user pays principle" can be achieved efficiently. Economic Instruments leave room for individual optimization, and thus make it possible to minimize transportation costs (Ren & Huang, 2020). The conclusion is that the implementation of road pricing and smart growth can have an impact on traffic developments in Indonesia. The things that we can apply are:

- 1) It is possible to influence the demand for transportation by means of tolls; they can effectively reduce peak demand and encourage replacement on other out-of-period trips and modes of transport.
- 2) Despite selective road pricing on some arterial roads, it is still possible to reduce traffic volume across the road network.
- 3) Using toll gates to collect tolls does not increase travel time when average traffic speed increases due to reduced congestion.
- 4) As part of an integrated transportation policy strategy (as described above), toll roads do not interfere with urban economic growth and development

#### 4. New Urbanism (Smart Growth)

Smart Growth is a term for policies that integrate transport and land use decisions, for example by encouraging more compact and multi-purpose development within existing urban areas, and preventing development that is dependent on cars and is scattered on the outskirts of cities. Some places that can be applied are (Kaparias et al., 2012)

- 1) Urban: In urban areas, it emphasizes the rebuilding and replenishment of existing urban environments, enhances multi-purpose design features (such



as City Traffic Calm and Location Efficient Development), and improves multi-modal transportation systems, especially walking and public transportation.

- 2) Suburban: In suburban areas these create centers of medium density, mixed use, multi-modal (sometimes called Transit Villages), either by gradually developing existing suburban communities or by developing master plans that reflect the principles Smart Growth. This encourages a fuller suburban community (more local services and jobs in suburban jurisdictions), and increases regional travel options such as Ridesharing and Transit Improvement. This supports the preservation of green space.
- 3) Rural: In rural areas Smart Growth involves policies that help channel development and public services to villages that are mixed access and use (for example, having schools, shops and affordable housing located close to and well connected to pedestrian facilities the good one),

Smart Growth is typically implemented as a set of policies and programs by state / province, regional or local governments. Their implementation often requires Policy, Institutional and Regulatory reform. To be effective, multi-jurisdictional coordination is required (Bukanová et al., 2021). Many professional and non-profit organizations involved in planning, urban development, and quality of life issues support Smart Growth. The impact of implementing smart growth in travel traffic is as follows Table 3.:

Table 3. Travel Impact from Smart Growth Development

Travel Impact	Objectives
Reduce Total Traffic	Resulting in more efficient land use and better travel alternatives.
Reduces peak period traffic.	Reduce car travel.
Improve access, reduce travel requirements	Results in more efficient land use.
Increased cycling and walking	Supports bicycle and walking for transportation

## 5. Conclusion

Institutional framework for implementing a set of TDM strategies. Such a program has stated clear objectives, goals, budget, staff and stakeholder relationships. This may be a division within a transport or transit agency, an independent government agency, or a public / private partnership. Institutional framework needs to be established in order for every element of pricing/management scheme are coordinated with each other, thus building a workable system. TDM Programs are usually established and Funded by local, regional or state/provincial governments, often within existing transportation agencies, or through grant programs. It may be organized as a division within a

transportation or transit agency, as an independent government agency, or as a partnership between government and other community organizations, such as a chamber of commerce. Listed below are the main functions and responsibilities of the TDM Program. Congestion pricing is a rather complex issue that needs the competent backing from being well organized transport planning authority. That agency needs professional skills to address a wide range of issues such as political issues, public awareness and transparency, transport planning, technical implementation, operational management, financial management and various other aspects. In many developing cities the creation of such an agency may be a major bottleneck to the introduction of road pricing.

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