



# TRAQ Technical Overview

## *Transportation Air Quality Center*

### Transportation Control Measures: Congestion Pricing



*EPA's main strategy for addressing the contributions of motor vehicles to our air quality problems has been to cut the tailpipe emissions for every mile a vehicle travels. Air quality can also be improved by changing the way motor vehicles are used—reducing total vehicle miles traveled at the critical times and places, and reducing the use of highly polluting operating modes. These alternative approaches, usually termed Transportation Control Measures (TCMs), have an important role as both mandatory and optional elements of state plans for attaining the air quality goals specified in the Clean Air Act. TCMs encompass a wide variety of goals and methods, from incentives for increasing vehicle occupancy to shifts in the timing of commuting trips. This document is one of a series that provides overviews of individual TCM types, discussing their advantages, disadvantages, and the issues involved in their implementation.*

# Congestion Pricing

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**Congestion pricing** is a relatively new transportation control measure (TCM) that is often referred to as “value pricing.” This TCM, which is still in the pilot program stage of development in the United States operates in one of two ways. It either provides a disincentive to driving on highly-used roadways by imposing fees in congested areas that vary depending on location, time or vehicle occupancy, or it offers a priced alternative to a congestion roadway that enables the motorist to reach his or her destination more quickly. These fees are intended to reduce congestion and improve air quality by encouraging people to change their travel patterns by shifting to off-peak periods, less congested travel routes, higher occupancy vehicles, or a different mode of transport (e.g., public transit). There are several congestion pricing measures which may be implemented such as variable tolls, high occupancy vehicle (HOV) lane permits, vehicle miles traveled (VMT) fees, and parking fees.

## 1. Background

Depending on their scope, these policies may be used in three ways: facility pricing, regional network pricing, or cordon pricing, as described below.

**Congestion pricing provides a disincentive to driving by imposing fees in congested areas that vary depending on location, time, or vehicle occupancy or offers a priced alternative to congested travel.**

- ➔ **Facility pricing** is a mechanism in which the pricing measure is levied on one or several roadways that link residential areas to downtown commercial districts. Fees may be imposed on new or existing roads, but usually it is more politically acceptable to impose fees on new facilities because people would not view the policy as taking away a free service. In order for a pricing measure to be considered an application of facility pricing, the purpose of the measure must be to reduce congestion. Therefore, many existing toll roads are not appropriate examples because their purpose is largely to raise revenue. Toll roads may be viewed as congestion pricing mechanisms if the fees are structured in such a manner as to influence demand. For example, charging higher fees during peak hours encourages people to rideshare or switch modes of transportation.
- ➔ **Regional network pricing** refers to policies in which people are charged to travel on a network of similar roads (e.g., highways). Unlike facility pricing, network pricing applies fees on multiple roads going in many directions. This fee structure results in a more accurate fee for vehicle use than facility pricing because more of the trip is included within the boundary of the system. Fees may be collected from

a series of toll booths along the network or from entrance and exit ramps on controlled access facilities.

➔ **Cordon pricing** is a mechanism which charges vehicles that enter high-activity areas such as central business districts.

Vehicles may enter an area via different types

of roads. This policy is implemented by identifying congested areas and encircling them with one or more cordons (lines). Then, fees are collected from people who drive into the encircled region via toll booths, special area permits, or parking permits. Prices may vary by time of day, so that during typical peak congestion periods, people will be reluctant to enter the cordoned areas. Although this pricing measure has been successfully implemented in such countries as Singapore, Norway, and England, it has yet to be implemented in the United States. [1]

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## 2. Costs and Benefits

The goal of congestion pricing policies is to mitigate congestion and improve air quality. Because congestion pricing policies are only in the pilot program stage of development in the United States, there is little empirical

evidence on the extent to which VMT and emissions are reduced. Theoretically, however, emissions will be reduced considerably because VMT and idling will decrease. The imposed fees will result in people switching from driving single occupancy vehicles (SOVs) to higher occupancy vehicles or mass transit. There will be fewer total VMT, which directly eliminates emissions of harmful pollutants. Fewer VMT during peak periods reduces congestion, which results in less idling. Idling is known to contribute significantly to carbon dioxide emissions, smog, and global warming. One study showed that congestion caused an extra 30 million tons of carbon dioxide to be released into the air in the United States in a recent year. [1]

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Besides improving air quality and reducing congestion, other environmental and financial benefits may result from congestion pricing policies. The environmental benefits are reduced oil and fuel consumption. According to one study, vehicles idling in heavy traffic waste three billion gallons of gasoline a year, which is 3 percent of total national gasoline consumption. [1] The potential financial benefits of congestion pricing include time, money, and vehicle operation and maintenance costs that will all be saved by each person who takes advantage of mass transit

or HOV lanes. Additionally, as more people switch to mass transit, more revenue will be generated that may be used for transportation improvements. Although implementing congestion pricing policies is not typically as expensive as other transportation control measures such as building rail lines, there are important cost considerations. Financial and human resources must be committed to planning, implementing tolls and HOV fees, and raising public awareness. Costs depend heavily on how extensive the program is. Facility pricing programs generally cost significantly less than regional network pricing and cordon pricing because, typically, only one roadway is affected. If congestion pricing policies successfully encourage people to switch to mass transit, the generated revenue may make these programs highly cost-effective.

### **3. Implementation**

Among the congestion pricing measures, single facility projects are generally the easiest type of policy to enact. Some of the reasons that single facility projects are easy to implement include:

- They are simplest in design and require the least up-front investment of government resources.
- They can be easily monitored and evaluated, especially if the facility has few entrances, exits, and alternate routes.
- They are relatively more politically acceptable because they focus on only one route. Under single facility programs, there may be alternative free routes people can choose, whereas regional network pricing projects may result in people being charged no matter which route they use.

Single facility projects are best suited for a corridor connecting residential neighborhoods with downtown areas. There are, however, at least two disadvantages to this option. Total VMT may actually increase as a consequence of imposing fees on the most direct route that people travel. Another potential disadvantage is that people may avoid the fees by continuing to drive on alternate routes, thereby shifting congestion to these non-priced alternative facilities.

Cordon pricing systems are most effective in business districts or other concentrated congested areas. Although inner-city congestion may be relieved, this congestion pricing policy may not reduce traffic on the region's freeway system leading into the city. Another limitation of the cordon pricing system is that once vehicles pay the fee for entering the area, there is no price difference for people who drive for a longer period of time than others. Cordon pricing may also result in the unintended consequence of congestion "spilling over" into streets adjacent to the cordoned area. Similar to single facility projects, congestion may simply shift from some roadways to others.

#### 4. Keys to Success

Although regional network pricing is more comprehensive than facility pricing, it has a greater potential to eliminate many free alternative routes. If a viable public transit system is unavailable, then regional network pricing would

likely be an unpopular policy. If, however, people are offered flexibility in choosing one mode of transit over another, this policy may be the most effective in reducing congestion and improving air quality because it is comprehensive in scope. Regional networking may supply the greatest impetus for people to ride in carpools, use public transit, or adjust their travel time in the face of high tolls. One potential obstacle to implementing this congestion pricing strategy is that coordination may be needed among county transportation officials if the network of roads encompasses several jurisdictions.

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All three congestion pricing strategies are relatively risky to implement because:

- ➔ People will be confronted with paying for a service they were accustomed to receiving free of charge.
- ➔ Convincing legislators and the public that fees are needed to relieve congestion and improve air quality may be a difficult task, especially if people are willing to endure congestion rather than pay more money to ameliorate it.
- ➔ Currently, it is not possible to project with great certainty the amount of emissions reductions that would result from these congestion pricing measures.

The few congestion pricing programs operating in the U.S. are still in the demonstration stage, and the evaluation methodologies required to determine emissions reductions from these measures are still being developed. Implementing these policies is risky because of the uncertainty of the price elasticity of automobile travel. Although there is not much practical experience in the U.S., there is evidence that commuter travel demand is relatively inelastic, meaning that price changes may not induce people to substitute mass transit for driving.

Instituting congestion pricing policies may be more politically appealing if the revenue generated is used in a manner which directly serves the public's interest. States and municipalities can use the revenue to offset implementation costs, pacify certain constituents, or improve transportation infrastructure.

## 5. Equity Issues

Implementing congestion pricing policies may have significant effects on various sectors of the population. People with low-to-moderate incomes tend to have fixed work schedules and child care demands that inhibit their ability to change their travel times and therefore avoid new fees. This income group may benefit in the long run, however, if revenue generated from the congestion pricing measure is used to construct or improve already existing mass transit systems. Members of higher income groups may also benefit from congestion relief because they tend to value time savings more than travel cost savings.

Cordon pricing policies may result in an inequitable situation for downtown business if people choose to avoid fees and shop in the suburbs. Commercial delivery businesses and companies in the transportation industry that need access to downtown areas may also be negatively affected.

## 6. Summary of Recent Examples

Because all congestion pricing programs in the U.S. are part of a pilot program initiated by the Federal government, the effects of the policies have not been thoroughly evaluated yet. There is evidence, however, that these strategies reduce congestion and thereby

improve air quality. [1] The first congestion pricing project in the United States was implemented on California State Route-91 and serves as an example of a single facility project. The project covers a 10-mile stretch of road that links Riverside County suburbs to business centers in downtown Los Angeles. The facility was built as a two-way, four-lane HOV road in the median of an existing freeway. This congestion pricing measure encourages ridesharing by charging SOVs and HOV-2s up to \$2.50 to access the lanes (price varies by congestion conditions), but allowing HOV-3+ to ride free. After 10 months of operation, 70,000 people have accounts with the California Private Transportation Corporation (CPTC), the private company that planned, constructed, and runs the program. Although it is too early to evaluate air quality improvements, CPTC claims that congestion has been mitigated in the corridor as evidenced by data that indicate 20 to 25 percent of daily trips on the new part of the freeway are HOV-3+.

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Another example of a congestion pricing project allows single occupancy drivers to buy access to existing HOV 3+ lanes on an 8.5 mile stretch of California I-15 located in Northern San Diego. In the late 1980s, two reversible HOV lanes were built in the median of the freeway, but an insignificant number of commuters substituted ridesharing for driving in SOVs. In an effort to increase use on these lanes, SOVs and HOV-2s may now pay \$50 per month to access the lanes. During the second year of operation, the system will be automated so that charges will be

assessed on a per-trip basis. Because motorists may pay to use faster lanes during rush hours, this project is considered congestion pricing, but this measure provides less incentive to rideshare. The San Diego project will benefit all motorists who currently drive in the congested lanes, because these users will experience time savings on their commute as people "buy-in" to the nearby lanes. It is estimated that the average driver on the facility will save 10 to 20 minutes per trip, but overall reductions in VMT and emissions are not likely to be noticeable because there is little incentive to switch to mass transit.

One of the more successful cordon pricing systems was implemented in Singapore. The Singapore Area Licensing Scheme was implemented in 1975 to reduce congestion in the central area during the morning peak period. In 1989, the system was expanded to include the afternoon peak as well. Twenty-two entry stations are located around the central area of the city where windshield inspections verify that a vehicle has the required permit. After introduction of the program, peak vehicle traffic in the central area decreased from 56 percent to 23 percent of all work trips. In subsequent years, vehicle traffic was consistently 23 percent lower than pre-pricing levels. [1]

## **7. Sources**

[1] *Congestion Pricing: A Transportation Demand Management Strategy*, Washington State Transportation Commission, Olympia, Washington (March 1994).

## **8. On-line Resources**

The Environmental Protection Agency's (EPA) Office of Mobile Sources has established the TCM Program Information Directory to provide commuters, the transportation industry, state and local governments, and the public with information about TCM programs that are now operating across the country. This document and additional information on other TCMs and TCM programs implemented nationwide can be found at:

<http://www.epa.gov/omswww/transp/traqtcms.htm>

The EPA's Market Incentives Resource Center (MIRC) Directory of Air Quality Economic Incentive Programs is an on-line resource which features a compilation of market incentive program (e.g., transportation pricing, vehicle buy-back, trading programs, etc.) summaries from around the United States. The MIRC Directory is posted as a link from the Office of Mobile Sources' home page at:

<http://www.epa.gov/OMSWWW/transp/traqmkti.htm>