U.S. Department of Transportation

Electronic Payment and Pricing

ITS Benefits, Costs, and Lessons Learned: 2014 Update Report

Electronic Payment and Pricing

Toll Collection
Transit Fare Payment
Parking Fee Payment
Multi-Use Payment
Pricing

Highlights

- Congestion pricing benefits drivers by reducing delays and stress, businesses by improving delivery and arrival times, transit agencies by improving transit speeds, and state local governments by improving the quality of transportation services without tax increases or large capital expenditures, and by providing additional revenues for funding transportation improvements.
- Congestion pricing projects can be costly to implement and operate, but the costs are offset by toll revenues, resulting in a positive benefit-to-cost ratio.
- Recent lessons learned show that educating the public about the benefits of congestion pricing and engaging political champions early in the process lead to successful congestion pricing projects.

Introduction

This factsheet is based on past evaluation data contained in the ITS Knowledge Resources database at: www.itskrs.its.dot.gov. The database is maintained by the U.S. DOT's ITS JPO Evaluation Program to support informed decision making regarding ITS investments by tracking the effectiveness of deployed ITS. The factsheet presents benefits, costs and lessons learned from past evaluations of ITS projects.

Congestion pricing, also known as road pricing or value pricing, uses ITS technology to charge motorists a fee that varies with the level of congestion. Value pricing reflects the idea that road pricing directly benefits motorists through reduced congestion and improved roadways. To eliminate additional congestion, most pricing schemes are set up electronically to offer a more reliable trip time without creating additional delay. Congestion pricing is different from tolling in that pricing strategies are used primarily to manage congestion or demand for highway travel, while also generating revenue to repay a bond or debt.

The U.S. DOT Congestion Pricing Primer describes four main types of congestion pricing strategies [1]:

- Variable priced lanes including express toll lanes and high-occupancy toll (HOT) lanes.
- Variable tolls on entire roadways or roadway segments (i.e., changing flat toll rates on existing toll roads to variable rates based on congestion levels).
- Cordon charge (i.e., charging a fee to enter or drive in a congested area).
- Area-wide charge including distance-based charging or mileage fees.

The electronic payment and pricing applications profiled in this chapter, particularly variable tolling and congestion pricing are key elements of the U.S. DOT Tolling and Pricing Program. For more information please visit the Tolling and Pricing Program Web site: http://www.ops.fhwa.dot.gov/tolling_pricing.

Benefits

Electronic toll collection is a proven technology that has greatly reduced toll plaza delays, with corresponding improvements in capacity, agency cost savings, and fuel consumption reductions. Congestion pricing builds on this success and "benefits drivers by reducing delays and stress, businesses by improving delivery and arrival times, transit agencies by

improving transit speeds, and state and local governments by improving the quality of transportation services without tax increases or large capital expenditures, and by providing additional revenues for funding transportation."[2] Recent congestion pricing initiatives have produced positive benefit-cost ratios, ranging from 1:1 to 25:1, as shown in Table 1.

Table 1: Benefit-to-Cost Ratios of Congestion Pricing Strategies.

Benefit-Cost Ratio	Description	Application
1:1 to 8:2	Benefit-cost estimates for dynamic pricing applications on freeway shoulder lanes ranged from 1.1 to 8.2. (2011-00777)	Freeway shoulder lanes
7:1 to 25:1	Integrated Corridor Management (ICM) strategies that promote integration among freeways, arterials, and transit systems can help balance traffic flow and enhance corridor performance; simulation models indicate benefit-cost ratios for combined strategies range from 7:1 to 25:1. (2009-00614)	Integrated Corridor Management
6:1	In the Seattle metropolitan area the net benefits of a network wide variable tolling system could exceed $28 billion over a 30-year period resulting in a benefit-cost ratio of 6:1. (2011-00694)	Network wide – freeways and arterials

Figure 1 shows ranges of benefits for select entries in the ITS Knowledge Resource database at: http://www.itsknowledgeresources.its.dot.gov/. Benefits can be seen with many different measures across multiple goal areas including mobility, safety, and the environment. In this case, congestion pricing benefits include travel speed increases, traffic reduction, crash reduction, carbon dioxide emissions reduction, and transit ridership increases.

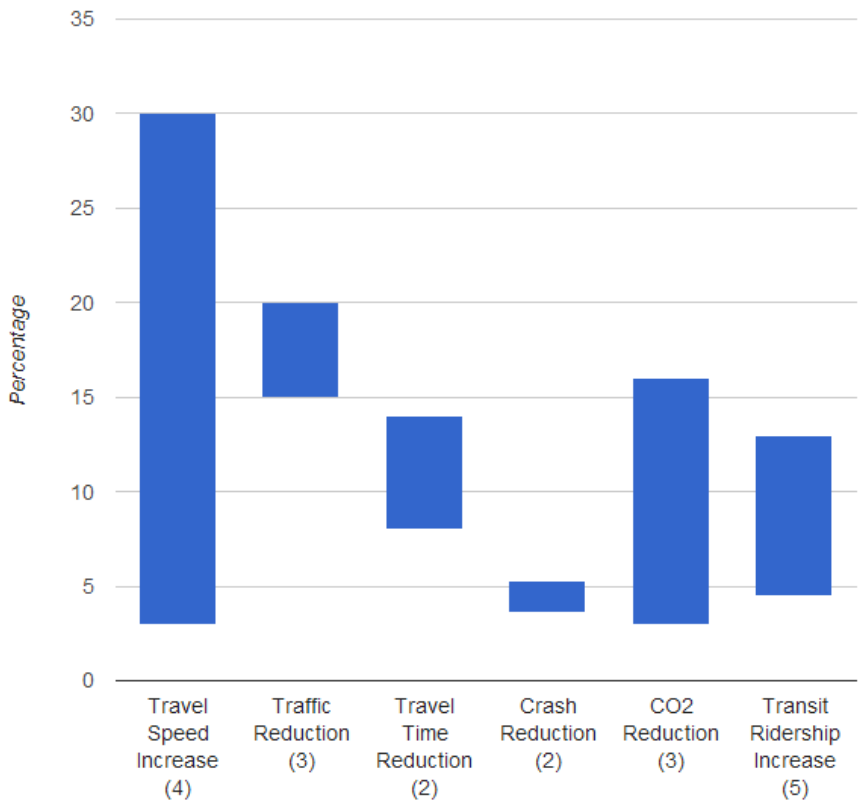

Figure 1: Range of Benefits for Congestion Pricing (Source: ITS Knowledge Resources).

The online versions of the factsheets feature interactive graphs that contain all the data points included in the ranges. Here, each metric has a number after the text, representing the number of data points used to create the range; no number means only there was only one data point.

Costs

Congestion pricing is becoming more popular as a viable and sustainable solution to traffic congestion. Increasingly, highly congested areas in the U.S. are looking at HOT lanes as an alternative to under-used HOV lanes.

Typically, the highest costs for congestion pricing stem from converting existing toll lanes to HOT lanes or building new ones. Operations and Maintenance, including enforcement, and maintaining toll readers, dynamic message signs and surveillance equipment is also a significant expense. In many cases these costs are borne or shared by a private entity that builds and manages the high occupancy toll lanes in exchange for some or all of the revenue generated by them.

Table 2: Congestion Pricing Capital Costs.

Description	Capital Cost	Type of Congestion Pricing	Location
Cost to convert HOV to HOT on an eight-mile section of I-15 in San Diego. (2008-00135)	$1.85 million	Variable priced lanes	California
Cost to convert HOV to HOT on a seven-mile section of I-25/US-36 in Denver. (2010-00201)	$9 million	Variable priced lanes	Colorado
Cost to convert HOV to HOT on an eleven-mile section of I-394 in Minneapolis. (2010-00201)	$13 million	Variable priced lanes	Minnesota
Cost to convert HOV to HOT on a nine-mile section of SR-167 in Puget Sound. (2010-00201)	$17 million	Variable priced lanes	Washington
Planning level estimate to convert HOV lanes to managed lanes on I-75/I-575 in Georgia. (2007-00128)	$20.9 to $23.7 million	Variable priced lanes	Georgia
Congestion pricing example in Italy. (2011-00213)	$72 million	Cordon charge	Rome
Congestion pricing example in Sweden. (2011-00213)	$500 million	Cordon charge	Stockholm
Congestion pricing example in the United Kingdom. (2011-00213)	$170 million	Cordon charge	London
Cost for the Orange County Transportation Authority (OCTA) to purchase a four-lane 10-mile-long limited access variable toll facility. (2010-00202)	$207.5 million	Variable priced lanes	California
Estimate to implement a network-wide variable tolling system in Seattle. (2011-00235)	$749 million	Variable toll – entire network	Washington
Estimate to implement a comprehensive VMT-based charging system for all road use in the Netherlands by 2016. (2011-00241)	$2.26 billion	Area charge based on Vehicle miles travelled	The Netherlands

Table 3: Congestion Pricing Operating Costs.

Description	Annual Operating Cost	Type of Congestion Pricing	Location
Congestion pricing example in Italy. (2011-00213)	$4 million	Cordon charge	Rome
Congestion pricing example in Sweden. (2011-00213)	$35 million	Cordon charge	Stockholm
Congestion pricing example in the United Kingdom. (2011-00213)	$161 million	Cordon charge	London
Rough estimate to operate a network-wide variable tolling system in Seattle. (2011-00235)	$288 million	Variable toll – entire networks	Washington
Rough estimate to operate a comprehensive VMT-based charging system for all road use in the Netherlands by 2016. (2011-00241)	$667.6 million	Area charge based on Vehicle miles travelled	The Netherlands

Congestion pricing projects can be costly to implement and operate, but the costs are offset by toll revenues, typically resulting in an overall positive benefit-cost ratio. Between 2003 and 2007, annual operating costs and revenues at 15 tolling agencies averaged $85.825 million and $265.753 million, respectively. In 2007, tolling agencies expended about 33.5 percent of revenues on toll collection operations, administration, and enforcement costs (2011-00240).

Recent lessons learned show that educating the public about the benefits of congestion pricing and engaging political champions early in the process lead to successful congestion pricing projects.

Lessons Learned

Engage political champions to keep controversial High-Occupancy Toll (HOT) lane projects on track.

In 2008, Los Angeles County Metropolitan Transportation Authority (Metro), with Caltrans and local mobility partners, was selected to participate in a one-year demonstration program beginning Fall 2012 to convert 25 miles of High-Occupancy Vehicle (HOV) lanes to High-Occupancy Toll (HOT) lanes on the I-10 and I-110 corridors.

Photo Source: LA County Metro

In 2009, six public hearings were conducted prior to the adoption of the tolling policy and toll rates by Metro. In 2010, two environmental impact reports (EIRs) and the Low Income Commuter Assessment were completed, and a contractor was selected to implement a design-build-operate-maintain (DBOM) contract. In 2011, construction was initiated and in 2012 operations were scheduled to begin on the I-110 followed by the I-10.

The following lessons learned were highlighted during the Urban Partnership Agreement (UPA) - Congestion Reduction Demonstration (CRD) program update webinar held December 15, 2011 (2011-00609).

- **Have a political champion to ensure successful implementation of HOT Lane projects.** Champions are critical to launch pricing projects to gain acceptance among key policy makers and other stakeholders.

- **Engage the public early and often throughout the life of the project.** Corridor advisory groups comprised of business and community leaders can collaborate on goals and refine project elements. Communication and public outreach is most important at key milestones.
- **Make HOT Lane projects multi-modal.** A multi-modal approach increases public acceptance. Advancing a variety of modal options enables everyone to benefit.
- **Address equity issues early in the planning process**. A comprehensive plan gains more acceptance if equity issues are integrated into the pricing project. So, while low income commuters generally use transit, they appreciate the opportunity to use the ExpressLanes when they choose.

Overall, the program is expected to reduce congestion and greenhouse gas emissions, increase travel time savings, and improve trip reliability. Updates are available on the Metro ExpressLanes project website: http://www.metro.net/projects/expresslanes/.

Case Study - I-394 MnPASS and I-35W Expansion

In May 2005, Minnesota implemented High-Occupancy Toll (HOT) lanes along 11 miles of Interstate 394 from downtown Minneapolis through the western suburbs. In 2009, the system was expanded to I-35W. In 2012, a study was conducted to see if the benefits initially reported were maintained over time (2013-00854).

Findings

The 6 percent increase in travel speed and 5 percent increase in volume reported during peak periods in the six-month period after I-394 HOT lane implementation in November 2006 have been maintained through year 2012. Expansion of the system to I-35W required a capital investment that was 37 percent that of the initial I-394 investment with an operating cost increase of only 17 percent above I-394 operating costs.

Benefits from the I-35W expansion were observed in a 3 percent increase in corridor volume while maintaining consistent speed on the mainline and HOT lane. Overall cost per transponder transaction has declined by 32 percent from year 2006 to year 2011. So while benefits are slightly lower, the lower operating costs may result in a higher benefit-cost ratio compared to the initial implementation. The overall benefit-cost ratio for the Urban Partnership Agreement (UPA) Projects that included the I-35W expansion was 6:1 (2014-00910).

- Have the initial impacts of the system on I-394 changed over time?
  –No, benefits were maintained
- Did the expansion to I-35W result in similar benefits?
  – No, slightly lower benefits
- Have economies of scale been obtained by I-35W expansion?
  – Yes, 32 percent lower cost/transaction

The benefits of HOV to HOT conversions and expansion have been maintained over time with lower operating costs.

References

[1] Federal Highway Administration "What is Congestion Pricing?" *Congestion Pricing, A Primer*, 2006. http://ops.fhwa.dot.gov/Publications/congestionpricing/sec2.htm.

[2] Federal Highway Administration, "Benefits of Congestion Pricing," *Congestion Pricing, A Primer*, 2006. http://ops.fhwa.dot.gov/Publications/congestionpricing/sec3.htm.

All other data referenced is available through the ITS Knowledge Resources Database, which can be found at http://www.itsknowledgeresources.its.dot.gov/.