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High Occupancy Toll Lanes

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High occupancy toll (HOT) lanes are road traffic management schemes whereby single occupancy vehicles are allowed to use high occupancy vehicle (HOV) lanes through the payment of a toll. Interest in HOT lanes has grown in recent years, and projects have been implemented in several cities in the United States. The use of HOT lanes has potential advantages in terms of reduced congestion and pollution. However, there are doubts regarding the financial viability of the schemes, as demand for the use of HOT lanes may be insufficient to generate the revenue required to finance the costs of implementation and operation. Critics have also questioned the equity effects of the projects, arguing that they benefit road users who have greater ability to pay.

High occupancy vehicle (HOV) lanes are usually open to vehicles with a minimum of two or three passengers. These lanes allow faster speeds than other lanes, reducing congestion and promoting carpooling. However, the lanes tend to be underutilized and as such they represent an inefficient use of road capacity. Public perception of this inefficiency also reduces the social and political feasibility of the implementation of new HOV lanes. High occupancy toll (HOT) lanes address these problems by extending the use of HOV lanes to vehicles with one or two occupants in exchange for a toll. The scheme is also known as managed lanes or express toll lanes. The last concept is also used to describe HOT lanes where all vehicles, including high occupancy vehicles, are required to pay a toll.

The toll is collected through electronic toll collection systems, charging automatically the owners of the vehicles registered in the system without requiring them to stop when entering the lane. The toll is usually variable based on congestion levels, either set at certain times of the day or adjusted in real-time based on traffic levels. In some cases, the use of the HOT lanes is free for all vehicles during off-peak periods. The use of these variable pricing methods facilitates the management of demand for the use of HOT lanes, ensuring an efficient use of the total road capacity throughout the day, while preventing congestion in the HOT lanes.

HOT lanes are typically implemented in large urban areas and address specifically the accessibility needs of commuters, aiming at a reduction of time in the journey to work. These lanes have fewer ingress and egress points than general purpose lanes, providing fast access from a selected number of residential areas to the central business district (CBD) or other areas with high density of employment or services.

The QuickRide scheme in Houston, Texas, was one of the first HOT schemes, allowing vehicles with two passengers to use HOV lanes during the peak period in the Katy Freeway. The scheme was introduced in 1998 and has since been expanded to other freeways. Similar projects have been implemented in other urban areas in the United States, with special incidence in California. These projects are usually limited to a selected number of roads in each city. However, in the San Francisco Bay Area an entire network of HOT lanes is currently being developed. This network will be 500 miles long upon completion in 2035.

Benefits and Drawbacks

The introduction of HOT lanes has a potential positive effect on urban accessibility, as the reallocation of traffic reduces congestion in general purpose lanes and allows for higher average speeds in those lanes without affecting speeds in HOT lanes. The implementation of HOT lanes also has advantages in terms of environmental quality, as the vehicle idling time on congested roads tends to be related to higher fuel consumption and higher emissions of

local and global air pollutants. However, this positive effect may be canceled if many users respond to the implementation of the scheme by shifting from carpooling to driving alone in HOT lanes, thus increasing traffic levels. In the cases where HOT lanes are newly built, there is also a negative environmental effect linked to the use of extra land or the construction of elevated sections.

The advantages of HOT lanes in terms of reduced congestion may not be fully realized if the scheme fails to attract enough demand. Although the use of the HOV lanes tends to increase after the introduction of the scheme, it has remained in many cases significantly below the targets defined by the operating agencies. This means that road capacity in HOT lanes stays underutilized and congestion in the general purpose lanes is still above the optimum.

The problem arises because road users can opt between the use of general purpose lanes and carpooling or driving in single-occupancy vehicles in the HOT lanes. The choice between these options depends on the toll charged and also on the characteristics of the trip, such as length, time of day, purpose, safety, and convenience. There is also an element of uncertainty affecting choice in the cases where the toll is determined in real-time, as users cannot know in advance the price they will pay for the use of the lanes. Research shows that HOT lanes are mainly used by drivers traveling longer distances. However, most drivers seem to use the lanes infrequently, for example, when traveling to places where they do not go on a regular basis. A survey of the use of the QuickRide facility in Houston showed that users of the system make less than 2.5 trips per month in the HOT lanes.

While HOT lanes are an additional source of revenue for transportation agencies, there are doubts regarding their long-term financial viability. The cost of implementation of the scheme is variable, depending on whether it involves the construction of new lanes or only the adaptation of existing HOV lanes. However, in the cases where demand is low, the system may not be financially sustainable if revenues are insufficient to cover operating costs.

There is also a high degree of monthly and annual variability in revenue, depending on macroeconomic variables (such as employment and income) and on environmental conditions (such as weather). A variety of funding and operating systems have been adopted, usually involving a mix of public and private capital. In the cases where the system is not financially sustainable, the system can be adapted by charging all users of the lane, including single-occupancy vehicles.

As with other road pricing schemes, there is also a social equity dimension to the effects of HOT lanes. Analysis of the socioeconomic characteristics of users of HOT lanes usually shows that individuals who are younger, single, and have lower income, lower education levels, and belong to racial minorities are less likely to use the system. Critics argue that because these groups have lower ability to pay to use the lanes, they are not provided with a choice to avoid congestion and are therefore at a disadvantage compared to other road users.

- carpooling
- vehicles
- roads
- passengers
- accessibility
- urban areas
- pricing

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See Also:

- High Occupancy Vehicle Lanes
- Road Pricing Schemes, U.S. and International
- Single-Occupant Vehicle Trips
- Traffic Control Devices

Further Readings

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