ARE HOV LANES GOOD PUBLIC POLICY?

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Abstract

High occupancy lanes are widely used within major metropolitan areas, presumably to promote car pooling to reduce the use of single occupancy vehicles. Within the Dallas area, HOV lanes have been constructed on I-45, I-30, I-635, I-35E and U.S. 75.

These highways become severely congested during morning and evening peak traffic periods, which would likely correspond to periods when car pooling would be most desired. Recent articles within the Wall Street Journal and Dallas Morning News identified significant deterioration of air quality and the economic cost associated with delayed traffic.

Studies independent of State Highway departments have shown that HOV lanes decrease traffic capacity, when compared with freeways with the same number of unrestricted lanes. Decreased capacity during peak periods of traffic flow increase air pollution and costs associated with delays.

Background

The concept for high occupancy lanes (HOV) lanes apparently originated in the 1970's in California. The basic idea behind the concept appears to be to promote car pooling as opposed to single use vehicles.

A study of the HOV system within the Dallas and Fort Worth area is posted on the Texas Department of Transportation's web site. This study provides a good overview of the system and TxDOT's general opinions regarding the effectiveness of the concept. In general, TxDOT's opinions are relatively "rosy" presenting the effectiveness of the system, and appear, from a layman's perspective, to be biased towards use and development of the HOV system.

HOV lanes are separated from the non-controlled lanes by various means. Within the Dallas area, various types of separation barriers are used, to include double paint stripes, pylon buffers, physical concrete barriers, and movable concrete barriers.

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Benefits versus Drawbacks

Traffic Capacity - One of the stated purposes of the HOV system within the TxDOT study is to "increase freeway efficiency by moving more people in fewer vehicles" which will "reduce vehicle emissions and improve air quality". The question is, does this actually happen?

Studies reviewed which were published by state transportation authorities overwhelmingly support HOV systems. All of the studies review sited increased traffic capacity with the addition of the HOV lanes. Logically, this is a "no brainer" since the addition of any lane would increase overall capacity. The real question is "does the addition of an HOV lane increase capacity, relative to the increase in capacity that the addition of a non-restricted lane would add to the freeway"?

A study by Kwon and Varaiya[2] statistically evaluated this question on the HOV lanes within the San Francisco Bay area. The HOV lanes studied are non-restricted for the majority of the time, with HOV restrictions on one lane during peak traffic periods. Their study found that during the HOV restriction, traffic capacity for the highway dropped from 2,000 vehicles per hour (vph) per lane to 1,600 vph per lane, or a penalty of 400 vehicles per hour per lane.

The counter argument to the drop in vehicle flow is the increase in persons per vehicle afforded by cars within the HOV lane. However, the Kwon and Varaiya study showed that the drop in traffic flow from 2,000 vph to 1,600 vph did not make up for the "reported" increase in persons per vehicle within the HOV lane.

The Kwon and Varaiya study also showed that there was no statistical evidence to support a claim that HOV lanes promoted car pooling. Their study found that, during peak traffic periods, cars with multiple occupants simply moved from non-restricted lanes experiencing delay to the restricted HOV lanes. This statistically dropped the number of multiple occupancy vehicles on the non-restricted lanes, but the overall number of multiple occupancy cars remained static.

Common sense would dictate that the addition of any lane to a freeway would increase capacity. During periods of normal flow, whether the lane is dedicated as a HOV lane or not does not have any significant impact on traffic capacity. However, during periods of congestion, restricting an available lane would logically reduce the overall capacity. It would seem to be logical, instead of restricting one lane, to meter or restrict traffic onto the freeway to reduce congestion to maintain traffic speeds.

[2] Kwon, J., and Varaiya, P. "Effectiveness of High Occupancy Vehicle (HOV) Lanes in the San Francisco Bay Area, unpublished paper, University of California, Berkeley, CA.

Safety – A study of the safety of HOV lanes within the Dallas area was performed by the Texas Transportation Institute[3]. This study found that non buffered-separated HOV lanes experienced a 41 to 56 percent increase in injury accidents, relative to an unregulated lane. This same study also found that the lane closest to the HOV lanes (non barrier conditions) experienced an increase in injury accidents of 153 to 188 percent.

The study period extended from 1997 through 2000 and reportedly accounted for the increase in traffic between the base years and study period. The increase in injury accidents was attributed to the speed differential between the HOV lane and the adjacent lane.

HOV lanes have restricted access points. Casual observation of HOV lane use clearly shows drivers entering and exiting the lanes at non-access points. This behavior increases with traffic congestion, making the speed differential hazard even greater during peak traffic periods.

Air Quality – One of the stated goals of development of the HOV system is an increase in air quality, presumably by increasing the flow of traffic and encouraging car pooling. However, if the Kwon and Varaiya study is correct, the construction of HOV lanes actually decreases traffic capacity while not changing attitudes towards car pooling. This logically would conclude that decreasing capacity would ultimately lead to an increase in air pollution and reduction in air quality.

Conclusions

Based on limited study, it would appear that HOV lanes are not good public policy. HOV lanes decrease traffic capacity in comparison to use as an unrestricted lane. Reduction in air quality would by inference increase health risks and costs associated with traffic delay. No studies encountered showed statistically that construction of HOV lanes encourage car pooling.

Admittedly, limited studies have been reviewed by the writer. Since transportation is not the writer's field of expertise, it is possible that studies independent of any governmental state transportation department may show some value to HOV lanes. However, based on even a preliminary review of the available literature, it appears that HOV lanes are detrimental to the health and safety of the urban public.

Appendix

The following are frequently asked questions on HOV lanes. The responses are from the FHWA web site. Surprisingly, many of the answers are directly in conflict with conclusions within independent studies.

1.

[3] Texas Transportation Institute. "Crash Analysis of Selected High-Occupancy Vehicle Lanes, 3/30/2005.

What is an HOV lane?
An HOV lane, sometimes called a carpool lane, is a special lane reserved for the use of carpools, vanpools and buses. They are usually located next to the regular, or unrestricted, lanes. These special lanes enable those who carpool or ride the bus to bypass the traffic in the adjacent, unrestricted ("general purpose") lanes.

2. **How do they work**?
HOV lanes are intended to save time for car-poolers and bus riders by enabling them to bypass the areas of heaviest traffic congestion. Because most drivers, especially during rush hours, are driving alone, the HOV lane is seldom congested. Giving car-poolers a reliable and congestion-free ride during rush hour serves as a strong incentive for ridesharing. HOV lanes also provide commuters a needed alternative to congestion, which is not always possible if all lanes are opened to everybody.

3. **I drive alone to work. Why should I support HOV lanes when I can't use them?**
HOV lanes benefit not only those who share the ride, but all drivers, taxpayers and area residents. First, by encouraging high-occupancy travel (that is, more passengers in fewer vehicles), these lanes can help ease congestion in heavily-traveled metropolitan areas. Second, by reducing the traffic burden on highways, they can help defer costly expansion projects. Third, by reducing the number of vehicles on the road, HOV lanes can help reduce the extent of exhaust emissions and contribute to cleaner air.

4. **Where would I find out about ridesharing opportunities in my area?**
Most state Departments of Transportation and local agencies sponsor programs to support ridesharing. These programs include ride matching databases to help commuters find carpool partners; coordination of employer ridesharing programs; vanpooling programs, and up-to-date information on transit alternatives throughout the area. Contact your state Department of Transportation to learn about its ridesharing program.

5. **Are there other types of HOV facilities, besides carpool lanes?**
While the most common type of HOV facility is a carpool lane, other types of HOV facilities include exclusive HOV ramps, bypass ramps at ramp meters, toll plazas and ferry docks, bus lanes and commuter parking lots with direct connections to HOV lanes.

6. **What does an HOV lane look like?**
For the most part, HOV lanes look like any other street or highway lane, except that it is typically delineated with signs and diamonds painted on the pavement. But there is a great deal of variety in the design and operation of HOV lanes. Some, called concurrent flow lanes, lie adjacent to, and operate in the same direction as general purpose lanes. Others, called contraflow lanes, operate in the opposite direction of adjacent lanes, enabling HOVs to drive on the "wrong" side of the highway with barriers separating them from oncoming traffic. Reversible lanes, usually placed in the highway median, run in one direction in the morning,

then in the opposite direction in the afternoon. Busways are usually physically separated from adjacent lanes, and are reserved for bus use only. HOV lanes are delineated by several methods, including barriers, medians rumble strips, buffer areas, and pavement markings.

7. **How many HOV lanes are there in the U.S.?**
   Currently, there are some 126 HOV freeway projects in 27 metropolitan areas in the U.S. These HOV facilities include over 1,000 route miles. There are more HOV lanes on arterials, especially those related to bus-only applications. There are also additional projects in operation in Canada.

8. **Is it legal to restrict publicly-funded highway lanes to HOVs?**
   Most state Departments of Transportation have the legal authority to regulate use of the highways, as long as the rules are applied fairly and serve a public benefit. Also, federal legislation – the Clean Air Act Amendments of 1990 and the Intermodal Surface Transportation Efficiency Act of 1991 – specifically encourage states to consider, and implement, if feasible, HOV lanes in areas experiencing air quality or traffic congestion problems.

9. **Who is responsible for building and operating HOV lanes?**
   Public agencies, such as State Departments of Transportation and transit agencies, construct and operate HOV lanes, often with federal funding support. Some municipal transportation agencies have built HOV facilities on local roadways, and in California, a private company has built a toll road on State Route 91 which serves carpools. (Note: SR 91 will charge carpools and all users starting in Dec. 97.)

10. **How are HOV lanes enforced?**
    All HOV projects rely on state or local police officers to monitor and enforce HOV lane requirements. In Washington State, a "HERO" program adds an element of self-enforcement, by encouraging commuters to report HOV lane violators to the State Police.

11. **What happens to drivers who violate HOV lane rules?**
    Violators can be stopped and cited by the enforcement officer monitoring the HOV lane, or simply re-directed back into the slower-moving general purpose lanes. Fines accompanying the citation vary from state to state, from $50 in Massachusetts to over $300 in California depending on the number of citations offenders have received.

12. **Why do some HOV lanes allow a minimum of two passengers per vehicle, while others require a minimum of three?**
    Entry requirements are set according to local travel conditions, levels of existing congestion, and projected use of the lane. If there is a high number of existing two-person carpools, then letting them all in might cause congestion in the HOV lane. If there are not enough three-person carpools and buses, then the lane might be perceived by the public as "empty." In all cases, entry requirements are designed to allow for high-speed travel, without allowing the lane to become

perceived by the public as under-utilized or congested. The balancing of these objectives can be difficult. Some states, in an effort to achieve this balance, have experimented with entry rules, changing them by time of day or raising or lowering the number of vehicles that can use the facility.

13. **Do children and infants count as passengers?**
    Yes. All states with HOV facilities count children and infants as passengers.

14. **Why do HOV lanes often appear empty?**
    HOV lanes, designed to be free of congestion, sometimes have the appearance of being lightly traveled, especially when compared with adjacent, congested unrestricted lanes. When the number of people traveling in an HOV lane is compared, though, HOV lanes are typically busier than unrestricted lanes. HOV lanes carry more people than unrestricted lanes, making them highly efficient as well as beneficial to air quality.

15. **Why are motorcycles allowed in some HOV lanes?**
    Motorcycles are permitted by federal law to use HOV lanes, even with only one passenger. The rationale behind allowing motorcycles to use HOV lanes is that it is safer to keep two-wheeled vehicles moving than to have them travel in start-and-stop traffic conditions. States can choose to override this provision of federal law, if they determine that safety is at risk.

16. **What about two-seater vehicles? Are they allowed to use HOV lanes with three-person requirements?**
    Usually not, although in isolated cases two-seater vehicles are permitted. Most states wish to maintain a consistent approach to enforcing entry requirements, and do not allow exceptions to entry rules. The entry rule is based not on how full the car is, but on how many passengers are in it.

17. **Are other vehicles prohibited from using HOV lanes, even with the appropriate number of passengers?**
    Yes. Many states prohibit oversized vehicles, such as tractor-trailer trucks, for safety reasons. For the same reasons, parades, processions and certain types of heavy trucks and large recreational vehicles are sometimes precluded from using HOV lanes.

18. **What is the safety record of HOV lanes?**
    Studies have shown that HOV lanes are frequently as safe as, and in many cases safer than, unrestricted lanes. The safest HOV lanes are those that are physically separated from the adjacent lanes with a concrete barrier.

19. **Do HOV lanes operate only during rush hours?**
    Operating hours vary from state to state. Some states operate their HOV lanes only during rush hours, when traffic is heaviest and HOV lanes are most likely to save time for car-poolers. During off-peak hours, these states either open the lanes to all traffic or simply close them until the next scheduled opening. Other states operate their HOV facilities around the clock. This approach helps to

provide ridesharing incentives at all times, and provides travel time savings during times of unexpected congestion, for example, during special events or when there is an incident or accident.

20. **Are HOV lanes effective?**
    Yes, though results vary from state to state. Nearly every state with HOV lanes reports that ridesharing and overall corridor person moving efficiency has increased since the lanes opened.

21. **What are some of the measures of effectiveness?**
    Evaluating HOV lanes is in some ways similar to evaluating other highway facilities – safety, vehicle volumes, and level of service are generally evaluated on both types of facilities. HOV evaluations also examine impacts on person movement (how many people, as opposed to how many vehicles, use the lane) modal shifts (how many people changed their travel behavior to take advantage of the HOV lane), and travel time savings are all important indicators of HOV lane performance.

22. **Can HOV lanes be put to other uses as well?**
    Yes. Some states open carpool lanes to all traffic when the rush hour is over. Others temporarily open the lanes to all traffic during rush hours if there is a major accident, causing much more severe congestion than usual of the highway. Some locales are considering allowing trucks to use the lanes during off-peak hours.

23. **Some say that HOV lanes aren't as good for air quality as they were originally thought to be. Is that true?**
    Several studies have been conducted on this topic, and while conclusions vary as to how much HOV lanes contribute to cleaner air, none dispute that their impact on air quality is positive.

24. **There are some areas with more than one HOV lane. Are these facilities coordinated with one another?**
    Yes. Many states and regions develop HOV "systems plans" to ensure that they are prepared to meet future HOV needs while coordinating the development of existing facilities. Washington State, California, Nashville and Texas all have conducted system planning to coordinate area-wide HOV facilities.

25. **How can I learn more about HOV facilities?**
    The HOV Facilities page of this web site and the HOV Pooled Fund Study web site provide more information on HOV facilities.