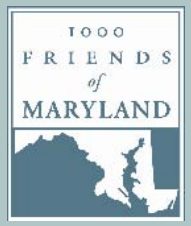
1000 FRIENDS *of* MARYLAND

# The Intercounty Connector:

## Financial, Economic, and Regional Development Costs and Choices

March, 2007

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## Introduction

Governor Martin O'Malley will soon decide on whether to proceed with financing and letting bids for the construction of the Intercounty Connector (ICC), a critical decision for the State of Maryland and its many communities, especially Baltimore City. Since the state has expended only a small fraction of the estimated $2.446 billion cost to build this proposed 18-mile, six-lane highway, Governor O'Malley has the opportunity to reexamine this massive public works commitment before rendering a final decision, aided by the findings of this report and other information.

It is certain that building the ICC will force Governor O'Malley and the General Assembly to raise state transportation taxes sooner and more substantially if other state transportation priorities are to be funded. For the governor specifically, a decision to advance the ICC will constrain his ability to move forward on other campaign pledges (especially his commitments to public transit investment), bind him to financial and policy commitments of the outgoing administration, and sharply define his transportation, environmental, and economic development legacy.

Project delays and pending lawsuits give the new governor an opportunity to reexamine this project's many impacts to determine if the ICC—*at this time*—is the best use of scarce state resources when compared to other urgent needs, including a multi-year structural deficit of more than $4 billion and a growing backlog of unfunded transportation projects. The state's transportation needs, specifically, have intensified not only because of the proposed plan to build the ICC but because of slow growth in state transportation revenues and rising construction and maintenance costs.

This report, for its part, highlights the key financial, fiscal, and regional economic development issues and considerations about the project that heretofore have not been clearly articulated. Key findings in the section on Regional Growth and Economic Development are supported by appendices to this report.

## ICC in its Broader Context

Since candidate Martin O'Malley pledged support for completion of the ICC, the state's financial and development outlook has changed considerably. First, the new governor has inherited a large structural deficit in the state's General Fund budget. The scale of the state's deficit was not well-documented during the gubernatorial campaign, but already this issue is dominating the debate in the General Assembly and even appears to be threatening new initiatives by the governor. In addition, debt features of the project further reduce the capacity of the state to finance other long-term capital needs.

A fuller accounting of the condition of the state's transportation finances is now underway, a process that is certain to uncover new information about underlying resource constraints and unmet needs. Already it has led state transportation officials to acknowledge that the purchasing power of the state's Transportation Trust Fund is so eroded that current funding will not support major new transit investments and available funds will be focused on system preservation.

Despite modest outreach efforts, the general public does not understand the financial implications of the project. Many do not know that this will be a toll facility where the public will pay hefty tolls to use it, estimated to average about $7.00 for a roundtrip over the full length of the highway. The public does not know that these high toll rates are needed even after proposing to commit more than $1.4 billion in state revenues from other sources.

In addition to financial details of the project, new information is now available on regional growth and economic development impacts of this highway. ICC development impacts are at odds with Governor O'Malley's expressed commitment to "smart growth" development principles. As detailed in the final section of this report, the ICC will likely induce significant development in and around the corridor, divert growth from Washington DC, urban Prince George's County and Baltimore to suburban areas, and cause the ICC to fill up prematurely at subsidized toll levels.

Finally, as the state was developing its plans for the ICC, little was known about how military base realignments would affect development and job growth patterns in the state. A new state report documents these likely impacts, calling attention to the need for costly state-funded facility improvements, most especially transportation improvements, in a North-South swath from Harford to Prince George's Counties.[1]

These key externalities and others are discussed further in this report and underlie its conclusion that Governor O'Malley should undertake a thorough reexamination of the ICC before rendering decisions on the project that will be extraordinarily difficult and expensive to retract.

## ICC and its Financing Elements

As approved by the previous Administration, the state, led by the Maryland Department of Transportation (MDOT), proposes to finance the ICC through a combination of current revenues and borrowed funds. Using different forms of long term debt, the state intends to incur new debt obligations, which this analysis estimates will total about $1.9 billion, with the remainder of the project costs funded largely from current revenues.

Table 1 shows the various program accounts, including proposed dollar amounts from each source, as set forth in MDOT's Initial ICC Financial Plan (6/06). As displayed in the table, the state to date has expended only a small fraction of the total costs of the project – about $57 million through Fiscal Year 2006. Governor O'Malley is now confronted with the decision on whether to commit the roughly $2.4 billion that will be needed to complete construction of the ICC (as currently estimated), a commitment that also binds the state to pay many hundreds of millions more in interest payments on borrowed funds well into the future.

Table 1. Summary of Project Funding by Fiscal Year

| Fiscal Year | MdTA Funds | GARVEE Bonds (Federal Funding) | Maryland General Fund | Maryland Transportation Trust Fund | Federal Funding Earmark | Total Funds |
|---|---|---|---|---|---|---|
| Contributions through FY2005 | $26.8 | $0.0 | $0.0 | $22.0 | $0.0 | $48.8 |
| FY2006 | $0.0 | $0.0 | $0.0 | $38.0 | $18.5 | $56.5 |
| FY2007 | $0.0 | $380.0 | $50.0 | $30.0 | $0.0 | $460.0 |
| FY2008 | $298.7 | $0.0 | $50.0 | $30.0 | $0.0 | $378.7 |
| FY2009 | $90.0 | $370.0 | $50.0 | $30.0 | $0.0 | $540.0 |
| FY2010 | $436.3 | $0.0 | $114.9 | $30.0 | $0.0 | $581.2 |
| FY2011 | $210.5 | $0.0 | $0.0 | $0.0 | $0.0 | $210.5 |
| FY2012 | $154.1 | $0.0 | $0.0 | $0.0 | $0.0 | $154.1 |
| FY2013 | $16.2 | $0.0 | $0.0 | $0.0 | $0.0 | $16.2 |
| **Total** | **$1,232.5** | **$750.0** | **$264.9** | **$180.0** | **$18.5** | **$2,445.9** |

Source: ICC Initial Financial Plan (6/06)

By proposing to borrow so much money for the project, which is typical of larger transportation projects, most of the project costs are shifted into the future. Over the near term, this reduces the impact of the project on current transportation revenues.

Features of the financial plan, most notably the General Fund input and the use of GARVEE bonds, have the effect of moderating the project's impact on the state's Transportation Trust Fund (TTF). The General Fund revenues are actually repayments to the TTF for funds previously borrowed to balance the state budget (although it is not shown as such in the financial plan). Similarly, the GARVEE bonds simply substitute for borrowing that might otherwise have been TTF debt, conveying the impression that the TTF is being shielded by this financing technique (even though MDOT forgoes a substantial share of its future federal transportation dollars which generally would be used for the same purposes as TTF funds). Both of these features were pivotal to the prior administration's effort to win the General Assembly's support for the ICC.

Importantly, the project's financing structure helped minimize public debate about the need for new state transportation revenues—specifically, higher gas taxes and fees—until after the previous governor's "first" term, when construction of the ICC was to have been underway. By limiting draws on current revenues, including TTF resources, project supporters were essentially shielded from coming to terms with both the actual financial costs and opportunity costs associated with building the ICC.

**ICC and the General Fund:** Under the current financial plan, the state is scheduled to make a series of General Fund payments—$265 million through 2010—to pay for ICC construction costs in the same fiscal years when new revenues and potentially substantial budget cuts will be needed to close the state's structural deficit. Ironically, honoring General Fund pledges to the repay the TTF (although assigned directly to ICC project costs) will make the state's deficit even larger, forcing the Governor and Members of the General Assembly to find greater spending efficiencies, adopt even higher taxes and/or make deeper budget cuts, for a project that would not be completed until 2013, at the earliest. Notably, this General Fund commitment to the ICC was made when the state budget was perceived to be in surplus, not in substantial deficit.

Finally, by assigning these General Fund revenues directly to ICC project costs, there was little or no debate on how these revenues could have been used for other, customarily TTF-funded projects throughout Maryland or other funding priorities.

**ICC and State Debt Capacity:** Subsequent to the development of the ICC's financial plan, specifically its reliance on GARVEE bonds, the state received a stern reminder that this form of debt will affect the state's debt limit, according to a recent analysis by the state's Department of Legislative Services (DLS). DLS found that existing state debt and authorized debt, including the issuance of $750 million in GARVEE bonds, will push the state to about 93 percent of its debt capacity. [2]

The state's limited debt capacity should be a concern to the Governor and Members of the General Assembly who soon will be struggling with various proposals to deal with the state's structural deficit. A decision to construct the ICC will consume a significant share of the state's remaining debt capacity, foreclosing certain options for addressing the state's future spending and revenue imbalances. As one example, the state will be less able to finance its long-term capital needs (e.g., school construction and repair) in areas with older infrastructure, specifically Baltimore City. In other states, tapping available debt capacity has often been part of a package of budgetary initiatives to bring state budgets into balance, helping forestall the need for higher taxes and/or deeper cuts in state services.

**ICC and Current Toll Payers on Other State Facilities:** As shown in Table 1, a key feature of the state's ICC financing plan is the funding provided by the Maryland Transportation Authority (MdTA), which is responsible for one-half of the project costs, now estimated at about $1.23 billion.

The MdTA will finance most of its share of ICC project costs through debt (i.e., 30-year bonds and federal TIFIA loans), backed by current and future revenues from toll payers at the state's other toll facilities as well as future revenues from users of the ICC. The agency has also pledged cash payments from its current revenues, although the financial plan does not specify the amount of cash and debt service to be paid by toll payers using the state's existing toll facilities. In assessing MdTA's role in financing the ICC, it is important to note that the agency is empowered to finance a range of transportation investments, including public transit (e.g., Baltimore area's proposed Red Line – see below).

- **Impact on Other Priorities.** For Baltimore-area residents especially, this substantial commitment to the ICC should be a cause for some concern. After all, about half of MdTA's toll revenues (about $136 million in 2005) are derived from the three toll facilities serving Baltimore City.[3] This is an important consideration for the Baltimore region, which has several major projects in the funding pipeline. One example is the Red Line, a proposed major east-west rail line, which is now scheduled for construction in 2010. MdTA's commitment of such a large share of its debt capacity to finance the ICC means there is less borrowing capacity available to finance the non-federal share of the Red Line. In effect, Baltimore-area toll payers will be underwriting an investment in another region that ultimately could impact upon the agency's ability to help in financing important transit facilities in Baltimore City.

For the Eastern Shore, diversion of toll revenues from the Bay Bridge to pay for the ICC will similarly reduce the capacity to fund bridge maintenance and additional Bay-crossing capacity. Governor-elect O'Malley specifically mentioned water ferries as a potential investment priority during his campaign. Financing new ferry service to and from the Eastern Shore expands travel options and could provide some congestion relief for existing toll facilities, including the Baltimore tunnels and the Bay Bridge, which are MdTA facilities. Such potential investments provide additional value for longstanding toll payers in these corridors.

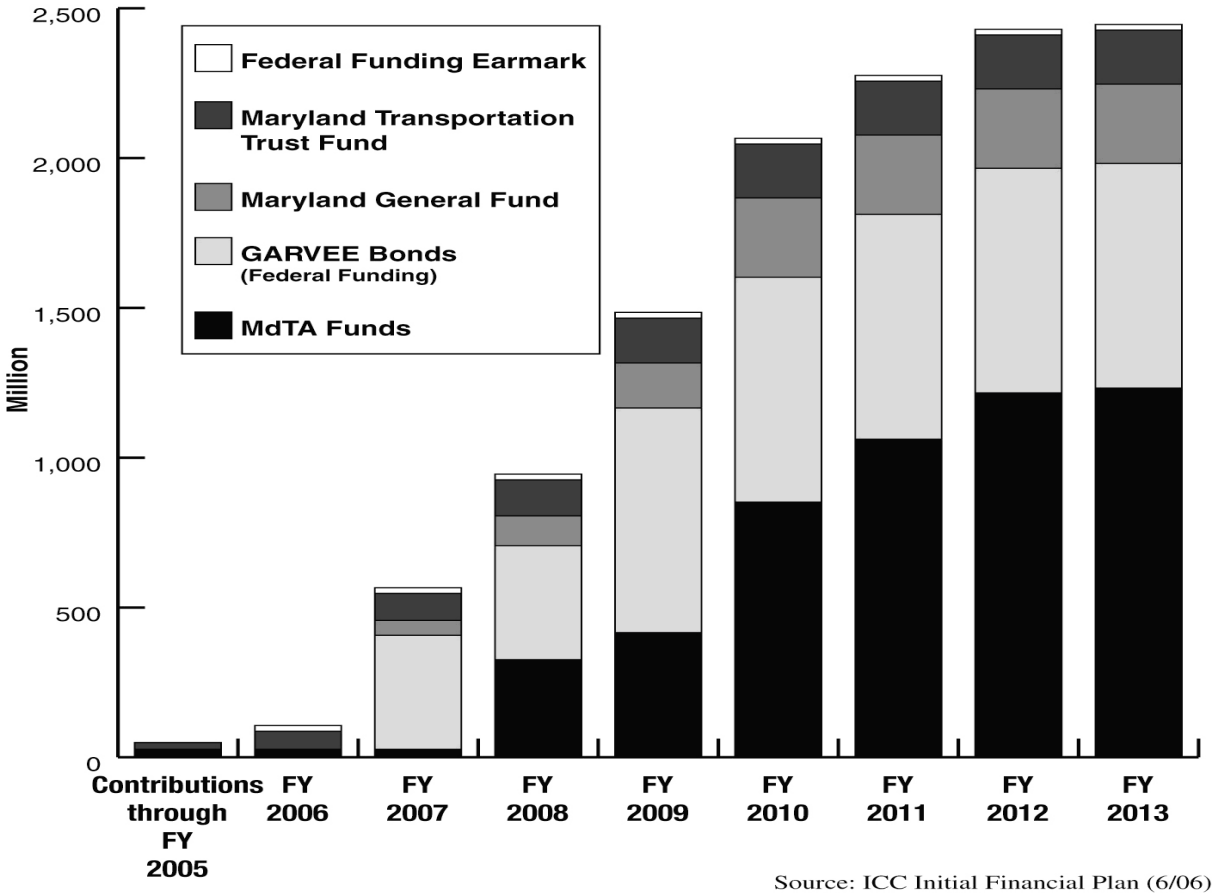
The interests of existing toll payers, the transportation needs in corridors where toll facilities exist, and the impact of ICC costs on the capacity of the Maryland Transportation Authority to fund other priorities are among the issues that should be examined by the Governor and his transportation team before any decision is made to advance the ICC to construction.

**ICC and Federal Funds (GARVEE Bonds):** The state plans to issue two Grant Anticipation Revenue Vehicle (GARVEE) bonds—$380 million during FY 2007 and $370 million in FY 2009—generating $750 million of the project's estimated completion costs. Including interest payments, the state will pay about $1 billion in principal and interest over the term of the bonds, but it uses expected or "anticipated" federal revenues from highway program accounts, not state revenues, for that pay-down.

This $1 billion commitment is satisfied by forgoing future federal highway funds, resources that could otherwise be made available for other state and local transportation needs. In fact, federal highway dollars are so flexible that this same amount could have been made available for transit improvements, if the state so decided, despite any claims to the contrary.

As shown in Figure 1, the state's financing plan relies heavily on GARVEE bond proceeds during the initial phases of ICC construction.

Figure 1. ICC Project Cumulative Sources and Uses Forecast




Source: ICC Initial Financial Plan (6/06)

This reliance on GARVEE financing during the initial stages of construction means that the state must start using a share of its federal highway funds to pay debt service beginning next year. In FY 2008, more than $46 million in future federal highway funds will be diverted to pay debt service on the first GARVEE bond; by FY 2012, debt service will consume about $84 million annually. To put this commitment in some context, $84 million represents about one of every five federal highway program dollars now provided to the State of Maryland.

- **Future Federal Funds More Uncertain.** The outlook for future federal transportation funding is now more uncertain than when the General Assembly signed off on the ICC's initial financial plan. In early February, President Bush released his Fiscal Year 2008 Budget Request, officially acknowledging for the first time that the federal Highway Trust Fund will be in deficit during Fiscal Year 2009. This is the same year the second GARVEE bond will be issued, committing an important share of the state's future federal highway funds to bond repayments.

## ICC and Maryland's Ongoing Transportation Expenditures and Needs

Maryland and many other states are confronting a "perfect storm" in their transportation programs, as costs for operations, maintenance, and capital expenditures continue to rise much faster than the growth in state transportation revenues and traditional measures of inflation. This is occurring as driving rates and gasoline use continue to fall below historic growth rates, reducing anticipated state gasoline and other tax receipts. For many states, debt service on previously borrowed funds is claiming a larger share of available transportation revenues. If Maryland moves forward with the ICC, the project will absorb more than $160 million annually in new debt service costs, an amount that equates to what Maryland now collects each year with six cents of its gasoline tax.[4] The effects of these trends can be seen in Maryland's transportation budget. The estimated growth in state

highway user revenues (e.g., state gas tax receipts) is less than two percent annually through 2011. This very limited growth in revenues cannot sustain the state's current transportation program. At the same time, the costs of maintaining the existing state transportation system pose serious challenges for the state, according to state transportation leaders. This is the stark reality faced by the O'Malley Administration, even prior to launching construction of the ICC.

- ***Base Realignment and Closure.*** During the initial planning for the ICC, the impacts of the coming Base Realignment and Closure (BRAC) job and housing relocations to Fort Meade and the Aberdeen Proving Ground were not fully understood. Current state estimates show potential transportation and other infrastructure needs for these two areas of the state could cost in the billions of dollars. Expansion of area highways, local road networks, MARC and Metro service, bus and rail service, and transit center facility development may be required.[5] Increasingly, it is becoming apparent that ICC funding commitments could crowd out funding for critical projects to support BRAC residential and job relocations. A recent state study on BRAC impacts shows that nearly all of new jobs and housing growth is expected to occur outside of areas directly served by the ICC.

- ***Major Transit Projects.*** Governor O'Malley has made several public pronouncements indicating his strong support for several major rail transit investments, including the Purple Line, Red Line and the Green Line extension to BWI. Baltimore-area residents, especially, are eager to keep the proposed Red Line on schedule, which is the most advanced of these projects and is slated to begin construction in 2010. Nonetheless, state transportation leaders have recently indicated that existing state transportation resources are insufficient to support new commitments to these projects. What is particularly notable about major *transit* investments is that, unlike the ICC, which is predicated on spending future federal transportation dollars to pay for the project, major transit projects—Red Line, Purple Line or even the proposed Green Line—hold the potential to attract additional federal dollars into the State of Maryland.

Every dollar invested in the ICC is simply one less dollar that is available for other needs in the state. Yet every dollar made available for rail transit holds the potential to attract one new federal dollar to the state (the Federal Transit Administration shares project costs on a 50-50 basis, on average). Deferring the ICC would keep a sizable share of existing state resources on the table as potential funding for the Red Line, as opposed to waiting for increased state transportation taxes to help finance this project.

- ***Local Government Needs.*** Local elected officials throughout the state are becoming more vocal about the erosion in the purchasing power of state transportation funds provided to their jurisdictions. Currently, 30 percent of state gas-tax receipts are returned to local governments, a resource that is now growing at about one percent annually, well below the level that is needed to keep pace with rising costs. To the extent dollars are available for construction of the ICC, these same resources could be shifted to local governments to help address rising maintenance needs or could be used to advance more modest capacity and system improvements. For example, among the local highway needs in Central Maryland are improvements to U.S. 29, which provides a key link between Baltimore City and the Washington, D.C., metropolitan area. Numerous improvements in this major corridor have been identified but lack funding. In every part of Maryland, local leaders can point to examples of such investments, many of which are relatively inexpensive, that could be advanced if additional funds were made available.

- ***Cost Overruns.*** If the ICC exceeds current cost estimates, Maryland DOT will have to commit additional state revenues to complete the project, further reducing resources for ongoing transportation projects and even forcing the state to postpone the startup of others. Maryland Department of Transportation officials have given assurances that the estimate to complete the ICC is realistic, indicating that the cost figures include some cushion for unbudgeted cost increases. However, the record of major transportation and other public works across the country indicates that even the so called "best estimates" often miss the mark, largely because of rising energy and construction costs. In the event that ICC costs exceed current

estimates, the financial plan sets forth potentially available funding sources to pay for these cost overruns: (1) annual federal program funds, (2) other unspecified federal funds and bond proceeds (presumably, additional MdTA debt or additional GARVEE bonds); and (3) other state funding sources (e.g., Maryland Transportation Trust Fund or the General Fund). The plan, however, does not describe how these additional costs will be allocated or might affect other state funding priorities.

## ICC and Financing: Who Pays and When?

To characterize how the ICC's costs are allocated among state taxpayers, it helps to draw an analogy to a home mortgage. The state plans to put down slightly more than 20 percent of the purchase price (the estimated cost of the project), and it proposes to borrow the remainder through a long-term mortgage (including 30-year bond commitments). The down payment is paid by all state highway users (through General Fund and Transportation Trust Fund revenues) and toll payers using existing toll facilities.

Who actually pays the mortgage is somewhat more complicated. During the initial years, mortgage payments are to be roughly divided between toll payers (revenues from tolls at six of the state's seven existing toll facilities) and state highway users (about 2 cents per gallon of federal gas tax allocations). At some undetermined point, ICC toll payers (and existing toll payers on other facilities, as needed) and state highway users would share the mortgage payments. During the later half of the mortgage, users of the ICC would purportedly be the sole payers.

The home mortgage analogy falls short in one important respect: *The final purchase price—the cost of the ICC—is actually uncertain.* In the likely event of cost overruns, the financial plan does not describe how additional costs are to be allocated among taxpayer groups.

- **Costs to Drivers and Other Taxpayers.** Surprisingly, state officials have done little to educate the public about the toll structure that will be deployed once the highway is operational. The state estimates tolls on the ICC will average about $7 for a roundtrip on the 18-mile highway. It also plans to use "dynamic tolling," which adjusts tolls upward to manage demand on the highway during peak periods. As such, some drivers would pay more to use the highway during congested periods, and others would pay less at other times of day. If ICC toll revenues paid for the project entirely, tolls for a roundtrip on the full length of the ICC would exceed an estimated $16 per day. The state's financing plan for the project—by relying on General Fund revenues, future federal dollars, and existing toll revenues from other parts of the state—helps keep planned tolls for the ICC lower, effectively subsidizing a daily roundtrip driver in the amount of about $190 per month.

At the same time, Consumer Expenditure Survey data issued by the U.S. Bureau of Labor Statistics (BLS) show that the Baltimore region has the lowest household transportation costs in the nation of the 28 metropolitan areas tracked by BLS.[6] Baltimore-area families spend about 14 percent of their household budgets on transportation each year, a level substantially lower than the national average of 19 percent.

This lower cost for transportation is a competitive advantage for the Baltimore region; keeping this advantage is directly tied to how the State of Maryland invests its transportation dollars. Whether the state invests its available dollars in the ICC or uses them to help expand travel options, such as rail and other transit services, has an effect on transportation costs for residents and regions. For the Baltimore region, the timely completion of the Red Line, for example, is the type of investment that will help the City and region, and keep average family transportation costs down.

## Regional Growth and Economic Development

In assessing the case for the ICC, regional growth and economic development considerations have not been adequately vetted. The concepts of induced traffic and induced development should be central to the discussion. The notion of induced traffic challenges the view that expanding existing roads or building new ones will necessarily relieve highway congestion. The idea of induced development challenges the view that highway investments are a *response* to growth and development, as opposed to a *cause* of them.

Investments in major transportation facilities increase the accessibility of locations near the facilities relative to the rest of the region, making these locations more attractive for development and thereby redirecting growth. Induced development means additional travel demands on existing and new facilities, and ultimately reduces the accessibility advantage of these favored locations. In time, such effects create a new equilibrium of land use and transportation, usually with higher vehicle miles traveled in the region and greater suburban sprawl.

To assess how the ICC is likely to affect development in the Washington-Baltimore region, the technical appendices to this report provide detailed information on:

1. effects of previous major highway investments in the region;
2. official forecasts for the ICC itself; and
3. research on highway-induced development generally, applied to the ICC.

The three paint a fairly consistent picture of likely development impacts of the ICC.

- ***Effects of Previous Highway Investments.*** In 1999, the *Washington Post* compared actual traffic volumes on I-270 with projections before construction ("Widen the Roads, Drivers Will Come—MD's I-270 Offers a Lesson," *Washington Post*, 1/4/99). The article declared the widening a failure based on the amount of induced travel, which quickly filled the added capacity. By 2000, traffic volume for certain sections of I-270 already exceeded forecasts for year 2010.

The Maryland-National Capital Park and Planning Commission (MNCPPC) and Metropolitan Washington Council of Governments (MWCOG) responded with a study in 2001 that suggested that induced development was mainly responsible for the high and premature levels of congestion on I-270. The study also cited a failure to build all transportation facilities in the adopted regional transportation plan of the time—some projects had been delayed, others dropped—as a reason for the premature congestion.

On the impact of induced development, MWCOG concluded that "higher observed traffic volumes relative to the 1984 forecast appear to be due in large part to shifts in population, employment, and travel to the I-270 corridor from other areas in the region, rather than to entirely new travel." For the region as a whole, population growth was 5 percent lower than had been forecasted in 1984, while employment growth was 9 percent higher. The two together suggested small (if any) net impacts of I-270 on regional growth.

However, population and employment had clearly *shifted* to the I-270 corridor, at the expense of other areas. Specifically, population and employment in the I-270 corridor were, respectively, 23 percent and 45 percent higher than forecasted in 1984. For all of Montgomery County, they were 7 percent and 21 percent higher than forecasted. Meanwhile, population and employment were 9 percent and 23 percent lower than forecasted in Prince George's County, and 29 percent and 3 percent lower than forecasted in the District of Columbia. A reasonable conclusion is that, even with dynamic tolling, the ICC is likely to fill up faster than projected, in part because of development shifts to the ICC corridor from elsewhere in the region.

- ***Official Forecasts for the ICC: Regional Growth Implications.*** There is only one comprehensive forecast of induced development due to construction of the ICC. This forecast, based on growth allocations by the ICC Expert Land Use Panel (ELUP), is the forecast cited in the Final Environmental Impact Statement (FEIS) and the ICC Secondary & Cumulative Effects Analysis (SCEA). It almost surely understates the induced impacts of the project.

Working with ELUP growth allocations, the FEIS and SCEA assert the amount of induced development related to the ICC would be 4,945 acres for Corridor 1 (the "Preferred Alternative") and 5,546 acres for Corridor 2. These acreages are beyond what is expected in the way of new development without the ICC.

These aggregate, predicted, induced development figures mask deep divisions within the ELUP. The idea of an ELUP is to bring together knowledgeable people with different perspectives and expertise, who through a deliberative process eventually agree on a "consensus" forecast. But for the ICC, the process did not result in convergence or consensus. Instead, differences among panelists averaged out to small impact values.[7]

Three panel members, concerned about the subjective and ad hoc nature of the panel's forecasts, collaborated on the development of a simple land-use forecasting model, which they tempered with expert judgment. The modelers' growth forecasts for the entire study area were higher than those of the other panel members. Other differences are illustrated in Figures 2 and 3:

- For Montgomery County, where the ICC seemingly would have its greatest impact, model-based forecasts of growth in both jobs and households were about three times higher than those based only on expert opinion. Differences were not uniform across the county: The model predicted larger increases in jobs at locations near the ends of the ICC facility, such as Rockville, Gaithersburg, Germantown, and Montgomery Village, as well as in places with an existing commercial character that would be given new direct access via the ICC, such as Wheaton, White Oak, Aspen Hill, and Burtonsville. With regard to households, the model predicted increases in the interior of the county that have had limited accessibility in the past, such as Deer Park, Cloverly, Burtonsville, and Potomac. In these instances, growth potential would overwhelm existing zoning capacity, as many of these zones are currently zoned rural or agricultural.

- For Prince George's County, panelists relying on expert opinion predicted modest growth of households and jobs related to the ICC. Using accessibility information, the modelers forecasted considerably larger increases. Much of the new growth would be located in the more suburban portions of Prince George's County, not in the older inner core, and particularly in places that would be well served by the ICC eastern extension into Prince George's County—Beltsville, Muirkirk, Laurel, and Laurel Pines.

- For Frederick County, most panelists felt that construction of the ICC in Montgomery County would have no effect on this trend. The model forecasted a large increase in households and jobs related to the ICC.

- For Washington D.C., the model projected somewhat greater losses for the District than did the rest of the panel.

- For Howard County, the model forecasted greater impacts than expert opinion alone would indicate.

- For Anne Arundel County, the panelists projected additional households and jobs, while the model forecasted losses.

Such an effort on the part of the three expert panelists was necessary because in the Baltimore-Washington region no integrated land-use and transportation-modeling capability currently exists. Hence, there is no objective means

of forecasting growth with and without the ICC. For a region this large, the absence of integrated modeling capability is remarkable.

*Land-use impacts of the ICC are likely to be much greater than assumed in the FEIS.* Montgomery County likely will attract much more growth than officially forecasted. Growth will spill over into Frederick County, exacerbating sprawl. Likely losers are Washington, D.C., Anne Arundel County, and Baltimore City (which falls outside the study area of the ICC expert land-use panel but likely will supply the net jobs and households projected by the simple land-use forecasting model).

Figure 2. Modeled Forecasts of Highway Impacts on Households

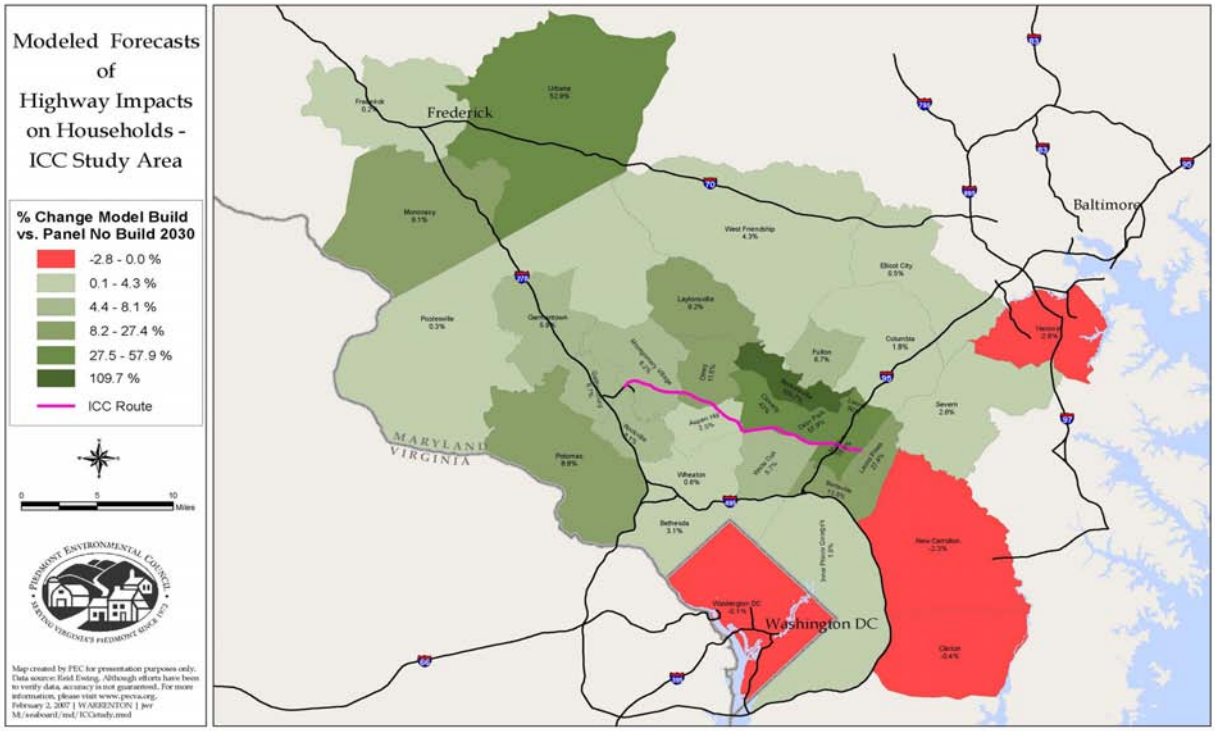
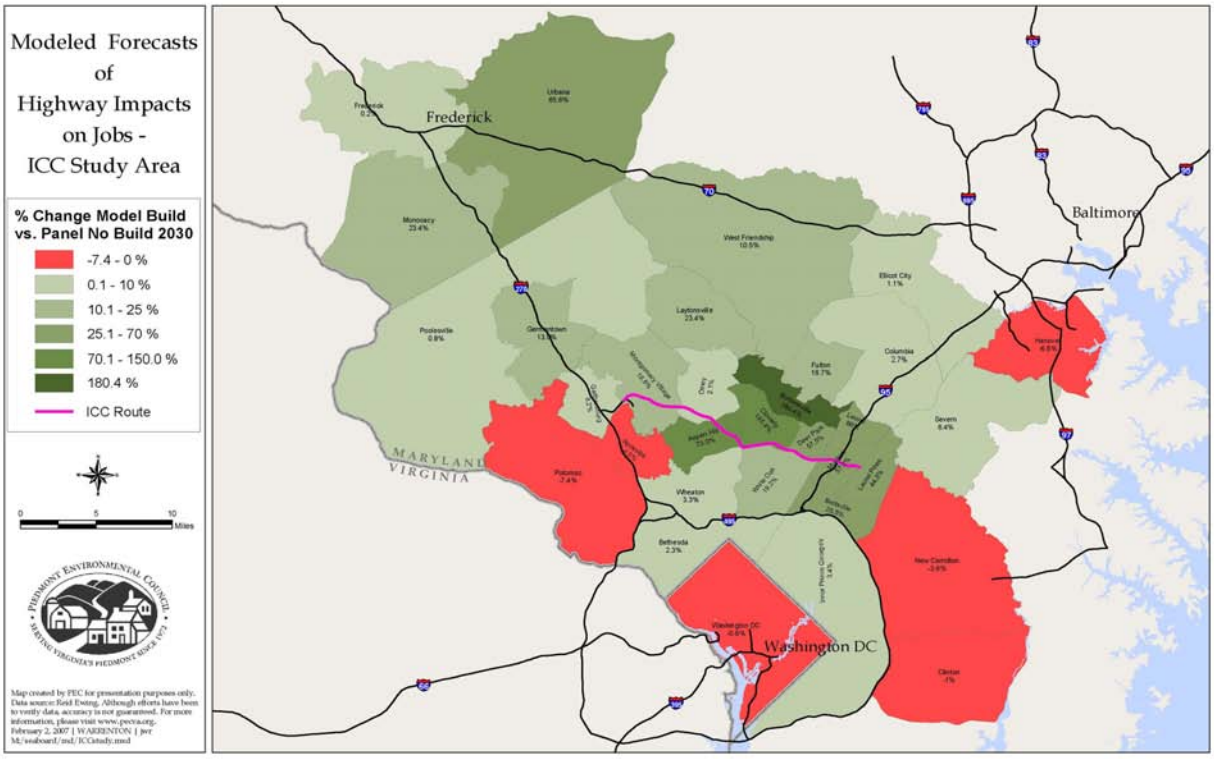


Figure 3. Modeled Forecasts of Highway Impacts on Jobs




- ***Highway Impact Research: Induced Travel, Induced Development.*** The best evidence available on the magnitude of induced travel comes from a meta-analysis by Professor Robert Cervero of the University of California, Berkeley. He concludes that "…the preponderance of research suggests that induced-demand effects are significant, with an appreciable share of added capacity being absorbed by increases in traffic." The average elasticities reported by Cervero imply that a 10 percent increase in capacity will result in a 6 percent or 7 percent increase in traffic in the "long term" (five-plus years out).

The research on induced development is not so easily summarized, as the phenomenon itself is so complex. But from the literature review in the technical appendices to this report, the following conclusions relevant to the ICC can be reported with a degree of confidence.

Implications for the ICC:

- Major highway investments have small net effects on economic growth and development within metropolitan regions, instead mostly moving development around the region to take advantage of improved accessibility. Induced development is very close to a zero-sum game. The ICC will produce winners and losers.

- Highway investment patterns tend to favor suburbs over central cities, thereby contributing to decentralization and low-density development. This will be true of the ICC.

- Major highway investments actually may hurt regional productivity if they induce inefficient development patterns (read "low density" development patterns). This may be true of the ICC.

- Corridors receiving major highway investments experience land appreciation and therefore are likely to be developed at higher densities than developable lands outside the corridor.

- Highways may be necessary, but they are not sufficient to induce development. To the extent that current planning and zoning caps are sustained, particularly in Montgomery County (an uncertain prospect), impacts within the corridor will be moderated.

- Counties receiving major highway investments attract population and employment growth to a greater degree than they otherwise might. Montgomery will be a clear "winner," as will (to a lesser extent) some of the adjacent counties.

- Nearby counties may experience more or less growth than otherwise, depending on the strength of spillover effects. The big losers in this case are likely to be at a distance, including Washington, D.C., and Baltimore City.

- Nonresidential development is more strongly attracted to major highways than is residential development, particularly in the immediate vicinity. There will be tremendous pressure to allow commercial and office development along the ICC.

- The induced development impacts are wider and deeper for interstate-quality highways than for lesser highways and streets. The ICC is of interstate quality, which means its impacts will be wide and deep.

- It takes many years after construction for development to adjust to a new equilibrium for land use and transportation. The development impacts of the ICC will be felt for a decade or more.

- The induced development impacts of major highways extend out at least one mile and probably farther. Although the most intense impacts of the ICC will be within a one-mile buffer, a project of this scale will produce development impacts regionwide.

## Recommendations

Within the context of the findings of this report, the following specific recommendations are provided to support a reexamination of the ICC by the Governor, Administration leaders, and the General Assembly:

1. Evaluate opportunities for financing other state transportation priorities with revenue and debt capacity now assigned to the financing of the ICC, and assess how funds currently proposed for the ICC could be utilized more efficiently.

2. Review priorities for the state's use of its remaining debt capacity.

3. Complete an assessment of the state's General Fund requirements, including new revenue needs, and align them with the state's transportation funding needs.

4. Examine the funding priorities of the Maryland Transportation Authority, including the share of toll revenues being diverted from existing facilities and corridors to pay for the ICC, and evaluate the potential costs of other priorities in the Baltimore region, the I-95 corridor, and the Eastern Shore as well as the toll revenues that may be needed to support these projects.

5. Accurately assess the land-use and economic development impacts on Baltimore, Prince George's, and other jurisdictions in the state.

6. Conduct a supplemental Environmental Impact Study of the ICC to consider transportation and land-use alternatives.

7. Evaluate alternative land-use and transportation scenarios and needs to support BRAC, and assess whether BRAC projects should merit higher priority.

8. Develop an updated cost estimate for the ICC.

## Endnotes

[1] Maryland Department of Business and Economic Development, BRAC Study, February 2007, can be found at – http://www.choosemaryland.org/businessinmd/militaryaffairs/BRACStudy.html.

[2] Maryland Department of Legislative Services, Spending Affordability Briefing, December 2006, can be found at – http://mlis.state.md.us/other/spending_affordability/briefing_120506.pdf.

[3] Maryland Transportation Authority, Annual Report, FY 2005.

[4] Maryland Department of Transportation, State Budget, FY 2006.

[5] Go to – http://www.mdot.state.md.us/Planning/brac/index.html.

[6] Bureau of Labor Statistics' Household Expenditure Survey data for the Baltimore metropolitan area were compared to 27 other metropolitan areas in a 2004 study, *Driven to Spend: Pumping Dollars out of Our Households and Communities*, by the Center for Neighborhood Technology and the Surface Transportation Policy Project.

[7] One of the authors of this report, Dr. Reid Ewing, was an ELUP member; he was one of the three who developed and relied on a simple land-use forecasting model.

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# The Intercounty Connector:

## Financial, Economic, and Regional Development Costs and Choices

## Technical Appendices

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National Center for Smart Growth
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March, 2007

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# Appendix 1

# Highway Induced Development: What Research Tells Us

## Introduction

Controversy exists over whether and to what extent the addition of highway capacity induces new traffic and promotes urban development in proximity to the added highway capacity. The notion of induced traffic challenges the view that the expansion of existing roads or the building of new roads will necessarily relieve highway congestion. The idea of induced development challenges the view that highway investments are a response to growth and development, as opposed to a cause of them. In the highway "wars" that ensue between environment and development interests, opposing sides have very different positions on the nature and magnitude of induced traffic and induced development. In this appendix we will attempt to sort out facts from debating points.

### Magnitude of Induced Traffic

Cervero (2002) compares elasticity values across studies in a so-called meta-analysis. An elasticity is the percentage change in one variable that accompanies a one percent change in another variable. An elasticity of Vehicle Miles of Travel (VMT) with respect to lane miles of 0.5 implies that every one percent increase in lane miles is accompanied by a 0.5 percent increase in VMT. Or equivalently, a doubling of lane miles (100% increase) is accompanied by a 50 percent increase in VMT. At the facility level, a doubling of lane miles is what you would get if a facility were widened from two to four lanes.

In his meta-analysis, Cervero (2002) extracts the average elasticities shown in the table.

| | Facility-Specific Studies | Areawide Studies |
|---|---|---|
| **Short-Term** | 0 | 0.4 |
| **Medium-Term** | 0.265 | NA |
| **Long-Term** | 0.63 | 0.73 |

Based on the meta-analysis, Cervero (2002) concludes that "…the preponderance of research suggests that induced-demand effects are significant, with an appreciable share of added capacity being absorbed by increases in traffic, with a few notable exceptions." The exceptions are among the more sophisticated studies, so the elasticity estimates in the table may be on the high side.

### Induced Development in Relation to Induced Traffic

Induced traffic and induced development are related. One can think of induced development as a cause of induced traffic, not immediate but longer term. To better understand induced traffic and its connection to induced development, it is necessary to explore the behavioral consequences of additions to roadway infrastructure capacity.

In the short-run a variety of behavioral changes can contribute to increased traffic without any induced development. These include route switches, mode switches, and changes in destination. In addition there is the possibility of new trips that would not have occurred without the addition in infrastructure capacity.

In the longer run, increases in highway capacity may lower travel times so that residences and businesses are drawn to locate in the area surrounding the expanded highway capacity. The question is always whether the new development that occurs in proximity to the highway was induced to locate there as a consequence of the expansion or whether it would have occurred anyway, regardless of the highway. Indeed, the highway investment may be a response to new or anticipated development, rather than vice versa. If the development itself would not have occurred otherwise, the traffic it generates and the development can be considered induced.

Definitionally, a grey area exists if the development that occurs near a highway would have occurred somewhere else in the region in the absence of the investment. Some would call this induced development, others simply redistributed development. We use the term induced development liberally to mean any development that would not have occurred at a given location without a highway investment.

## Complexity of Induced Development

Induced development is a complex phenomenon, which helps account for the divergent viewpoints regarding its magnitude, and even its existence. One reason for the complexity is that highway infrastructure has both spatial and economic properties. On the one hand, highways allow movement, communication, and market exchange. Highway investments may affect household location decisions by lowering travel costs. Household location decisions may, in turn, influence the location decisions of firms and industries, and vice versa.

On the other hand, highways are an input into the production of private goods and services. Lower transportation costs may boost private sector productivity and output generally across the region. If so, highways will affect the economic landscape in ways that no simple location model can capture.

Because of these two distinct properties, the inter-jurisdictional effects of highway investments may be either positive or negative. Development and other economic activity may flow from jurisdictions without highway investments to jurisdictions with highway investments. Alternatively, positive spillovers from jurisdictions with highway investments may cause economic growth in neighboring jurisdictions without highway investments. Metaphorically, highway investments may create a rising tide that lift all boats, or it may lift some as it capsizes others. Which effect dominates is an empirical question, hence the need to review the empirical literature.

## Historical Changes in Induced Development

Clearly, impacts of highway investments are less today than they once were. Construction of the Interstate Highway System, in particular, has tied virtually every place in the country to everywhere else. Most studies finding sizeable highway impacts (e.g., Mohring 1961, Czamanski 1966, Korsi 1974) date back to the first round of Interstate Highway construction, which created huge positive externalities for areas gaining access to the network. By the early 1970s, the Interstate Highway system was largely complete. Incremental additions or improvements to the network have since produced comparatively small improvements in interregional accessibility.

So, in the post-Interstate era, how great are highway impacts on economic and land development? This is a subject of great debate. In a well-known point-counterpoint, Giuliano (1995) minimized the importance of highway investments for three reasons:

> "The transportation system in most U.S. metropolitan areas is highly developed, and therefore the relative impact of even major investments will be minor. The built environment has a very long life....Even in rapidly growing metropolitan areas, the vast proportion of buildings that will exist 10 to 20 years from now are already built. … Transport costs make up a relatively small proportion of household expenditures."

Cervero and Landis (1995) countered that "although new transportation investments no longer shape urban form by themselves, they still play an important role in channeling growth and determining the spatial extent of metropolitan regions by acting in combination with policies such as supportive zoning and government-assisted land assembly." They then challenged Giuliano's empirical evidence, and presented evidence of their own.

Who is right? Giuliano probably is right about aggregate impacts, while Cervero and Landis probably are right about localized impacts. The following sections provide a sampling of research on highway impacts. The sample is by no means exhaustive, but is representative of the literature in the two subject areas: aggregate impacts of highways and localized impacts of highways. Other relevant studies (not reviewed herein) are included in the bibliography. This review updates earlier literature reviews by Huang (1994), Boarnet (1997), Boarnet and Haughwout (1999), Ryan (1999), and Bhatta and Drennan (2003).

## Aggregate (Net) Impacts of Highways

Numerous studies have analyzed the net impact of transportation infrastructure investment and economic growth (see literature reviews by Boarnet, 1997; Bhatta and Drennan, 2003). Such studies typically estimate production functions, with economic output explained in terms of labor, capital, and other factors of production. Capital inputs include public capital, public capital includes transportation infrastructure, and transportation infrastructure includes highways. Aggregate impacts of highways on economic growth have been estimated for the nation, states, metropolitan areas, and even counties.

Effects of infrastructure investment on economic growth have varied widely among studies. Early studies at the national level showed large effects. Early studies at the state level showed smaller but still significant effects. Effects at the metropolitan or county level were smaller still, presumably because some of the economic advantage of infrastructure advantage of investment is lost to smaller areas through positive spillovers to their neighbors.

Later, more rigorous studies (with fully specified production functions and lagged input variables), suggested that public infrastructure plays a more limited role in economic growth, or perhaps no role at all. Here we quote Boarnet (1997):

> Once the appropriate econometric techniques are used, even the time series evidence usually shows no statistically significant productivity effect from public capital (Tatom 1991). Later cross-state studies verify this result. When controlling for unique state and year effects, which in general is the preferred approach, recent studies find no statistically significant effect from public infrastructure (Evans and Karras 1994; Garcia-Mila, McGuire, and Porter 1996; Holtz-Eakin 1994; Kelejian and Robinson 1994). These results are the same when only highway capital is used as an independent variable (Holtz-Eakin and Schwartz 1995).

As an example, Garcia-Mila et al. (1996) modeled gross state product in terms of total employment, total private capital stock, and total public capital stock broken down into three categories—highways, water and sewer systems, and other. Without controlling for unique state effects, highway capital stock has a large, positive, and significant effect on gross state product. After accounting for state effects, the effect of highway capital stock becomes small (but still significant).

Metropolitan area studies have not been adjusted to control for unique metropolitan area effects. However, since effect sizes vary directly with the size of area, it is safe to assume that that highway investments within metropolitan areas have only marginal effects on gross regional output. This is not to say that highway investments have no role in the private economy, but rather that in the post-Interstate era, there is ample infrastructure already in place and marginal effects on output are bound to be small. The main justification for highway investments is their benefits to users, not their effect on the local economy.

# Localized Impacts of Highways

Even if the net economic impacts of highway investments are marginal, highways may have important impacts on the geographic pattern of development within a region. "…it is quite possible that infrastructure investments made by states are indeed productive assets, but that their value is reflected in the fact that economic actors will change locations within, but not across, states to utilize new public works (Haughwout, 1999).

In this section we review evidence of highway impacts at the relatively fine geographic scale of the county or smaller. Studies reviewed either look at direct effects on development, growth, or output, or indirect effects through property values.

## Lichter and Fuguitt (1980)

Lichter and Fuguitt analyzed patterns of growth for nonmetropolitan counties between 1960 and 1970. Some counties were exurban just outside metropolitan boundaries, others more remote. Being on an Interstate had both direct and indirect effects on population growth, the indirect effects occurring through growth of employment in export services and tourism industries (see Figure ). From 50 to 80 percent of the total effect was indirect, through employment. An Interstate highway's effects were greatest for nonmetropolitan counties near metropolitan cities. Overall, though an Interstate's effects were small, the "consistency of evidence provided on the relationship between date of completion of the interstate highway and various demographic measures was striking."

## Payne-Maxie Consultants (1980)

Payne-Maxie Consultants examined the influence of suburban beltways on the growth of suburbs and central cities in fifty-four U.S. metropolitan areas. They concluded that beltways have little impact on overall growth of metropolitan areas, but they also concluded that beltways may shift growth from one place to another within a metropolitan area. The magnitude of land-use impacts were deemed dependent on (1) overall local economic conditions, (2) proximity to medium- or high-income residential areas, (3) availability of land to develop, and (4) favorable local zoning policies.

## Stephanedes and Eagle (1987)

Stephanedes and Eagle studied the interaction between highways and employment for 30 nonmetropolitan counties in Minnesota over a 25-year period. They found positive impacts of highway expenditures on local employment (beyond the regional trend) only in the Minneapolis-St. Paul Metropolitan Area. This was attributed to the greater capacity of the metropolitan area to absorb growth, compared to other areas within the state. Positive impacts of highway expenditures in certain counties were offset by negative impacts in adjacent counties.

## Carlino and Mills (1987)

Carlino and Mills analyzed development densities circa 1980 for 3000 U.S. counties in terms of economic, demographic, and policy variables, and regional dummy variables to capture climatic effects. Population and employment densities were modeled jointly using structural equations to reflect the interaction between them. The density of Interstate highway mileage within the county was among the significant variables in both models. Elasticities suggested that a doubling of Interstate highway mileage would result in approximately 2.8 and 6.1 percent increases in population and employment densities, respectively. Interstate highway access was not a dominant influence, nor was it inconsequential.

## Rephann and Isserman (1994)

Rephann and Isserman isolated impacts of Interstate highways by comparing highway-impacted counties to control-group counties. They compared output and income series before and after highway construction. Their data covered 334 U.S. counties from 1959 through 1984. Counties were classified as: competitive (home to small cities that got Interstate mileage during the period), urban spillover (near large cities with Interstates but without their own Interstate mileage), uncompetitive (predominantly rural with Interstate mileage), and adjacent (close to highway-impacted counties but off the Interstate). Results showed the strongest impacts in urban spillover counties, followed by competitive counties. Significant negative impacts were found in adjacent counties, possibly reflecting a flow of resources out of the adjacent county toward the new highway investment.

## Boarnet (1998)

Boarnet estimated a production function using panel data for California counties from 1969 through 1988. County gross product was modeled in terms of labor inputs, private capital inputs, and highway capital stock of the county itself and its neighbors. The study used lagged variables to test the premise that causality runs from changes in the highway stock to changes in output, not vice versa. Results showed that output of a county was larger when a county's own highway stock was larger than its neighbors; but county output was smaller when the highway stock in neighboring counties was larger. This suggested not only that highway stock increased output at the county level, but also that the output gains were at the expense of neighboring counties.

## Hansen et al. (1998)

Hansen and colleagues employed econometric techniques to study land-use impacts of highway expansion in several corridors in California's four largest urban areas. Land development was measured in terms of construction permits. Highway expansion had the effect of increasing the number of single-family housing permits in the corridor relative to the level in the region. The results for multi-family housing permits were similar. Highway expansion was found to have an immediate positive impact on commercial but not on industrial development. The effect on commercial development diminished over time. The authors concluded that "highway capacity expansion stimulates development activity, both residential and non-residential, in the corridors served by the expanded facilities."

## Voith (1998)

Voith examined the geographic distribution of transportation investments in the Philadelphia metropolitan area, focusing on differences between the city and surrounding suburbs. He presented county-level estimates of total, per capita, and per user highway investments over the 10 years from 1986-95, as well as fees generated by highway users. The central finding: highway capital expenditures were about 2.5 times higher on a per capita basis in the suburbs than in the city. Even when transit investments were included in the analysis, per capita transportation investments benefiting suburban residents exceeded those benefiting city residents by 47 percent. Voith's conclusion: highway investments have provided an economically significant, although not overwhelming, incentive for suburban population and employment growth at the expense of the city. A reasonable guess as to the impact of differential highway investments would be a net loss of 40,000 jobs for the city.

## Haughwout (1999)

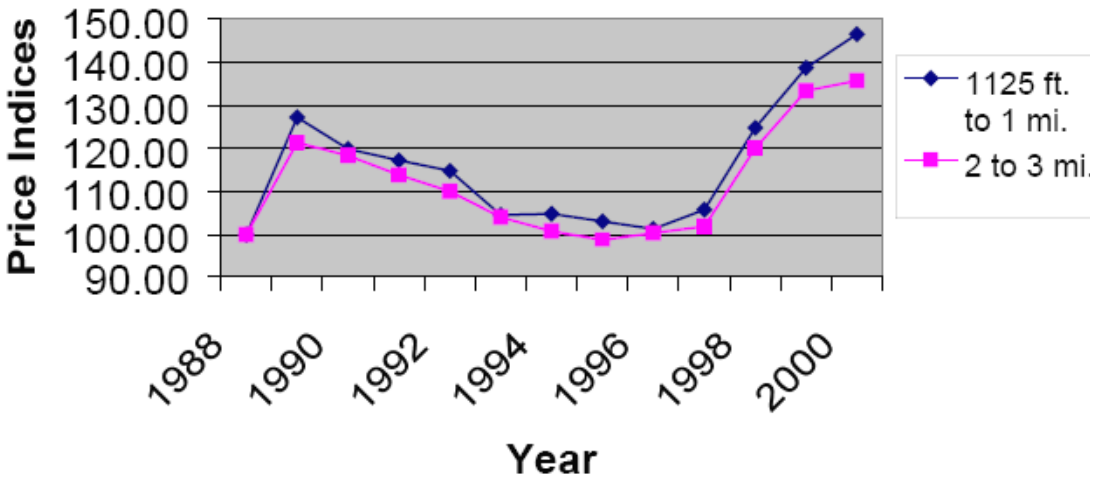
Haughwout related county employment growth to state highway investments, other state infrastructure investments, county employment density, and other economic variables for the period 1974-92. Results suggested that state infrastructure investments redistributed growth from dense to less dense metropolitan counties. His explanation: by reducing the cost of travel, state highway investments undermine spatial advantage of dense urban counties. The redistributive effect was limited to metropolitan areas; state highway investments did not

appear to spur employment growth in non-metropolitan counties. Because dense areas tend to be more productive, the net effect of state infrastructure investments may be to reduce overall employment growth.

## Boarnet and Chalermpong (2000)

Boarnet and Chalermpong conducted a before-and-after study of the impact of new toll roads on single-family detached house prices in Orange County, CA. The study used hedonic price analysis and multiple sales price analysis to examine how the opening of the toll roads altered house prices in nearby areas between 1988 and 2000. Highway access was measured by distance to the nearest toll road on-ramp. The evidence suggested rather strongly that changes in accessibility were reflected in home sales prices. The evidence was particularly strong for the Foothill Transportation Corridor (see Figure 1). Thus it was "reasonable to conclude that new highways will also create changes in development patterns," as higher prices lead to higher densities of development.

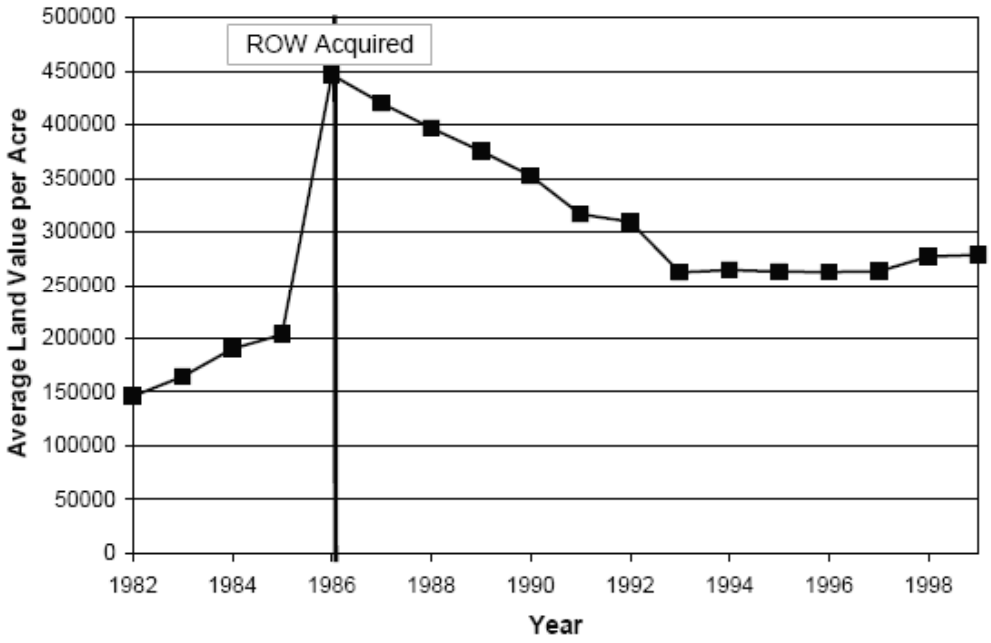
Figure 1. House Price Indices for the Foothills Transportation Corridor (as a function of distance from the highway beyond 1,125 ft)

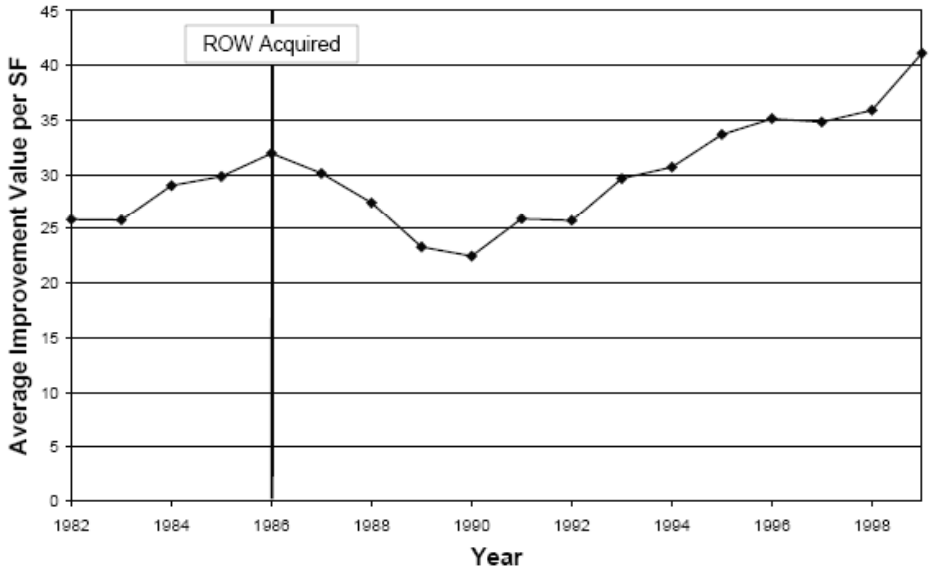



## Kockelman et al. (2001)

First, Kockelman and associates analyzed nine years of building permit data for planning areas in Austin, TX. The results suggested that highway expansions had no impact on development activity. However, the authors acknowledged that more spatially disaggregate and/or larger data sets might have led to a different result. Then, they studied seventeen years of tax assessment records for parcels along an improved highway. They found significant inflation in land values in response to right-of-way acquisition, subsequent declines from their speculative levels, and then gradual rises as development occurred (see Figures 2 and 3). The subsequent statistical analysis confirmed that the year of land acquisition was significant in land value adjustments and that the value of land on corners and land with frontage on a major facility were much higher than the value elsewhere.

Figures 2 and 3. Average Assessed Values Before and After Right-of-Way Acquisition



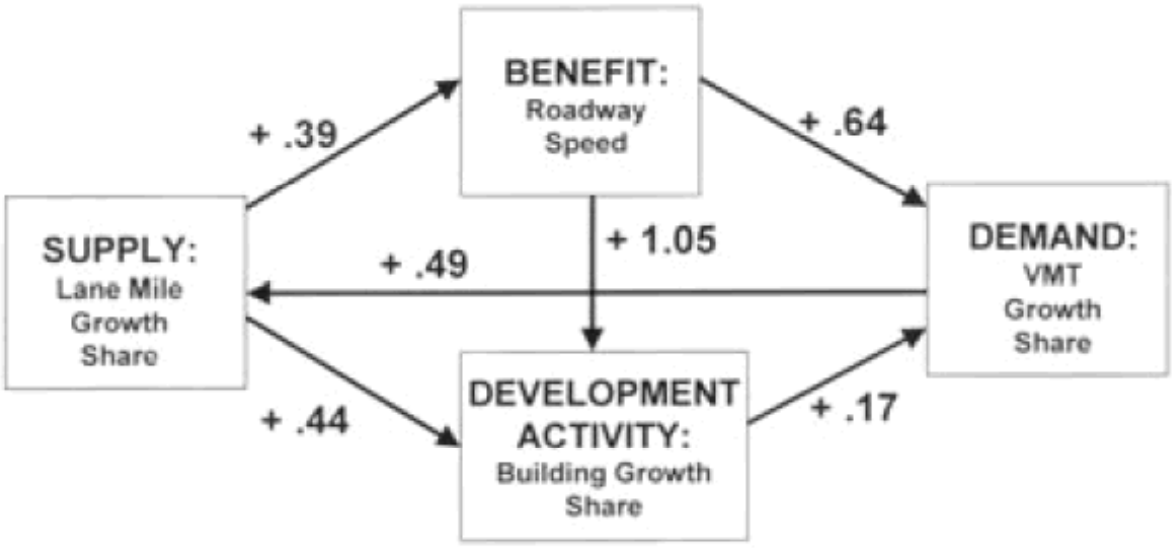

## Bollinger and Ihlanfeldt (2003)

Bollinger and Ihlanfeldt use data from the Atlanta region between 1985 and 1997 to estimate the change in a census tract's share of regional employment as a function of tax incentive programs, highway and transit infrastructure investments, and crime. The results show that tracts containing rail station areas lose employment share but this effect is never statistically significant. In contrast, highway improvements within the tract cause employment share to grow by about 0.00006 in the year following the completion of the improvements, which translates into a job gain of about 70 jobs. These results are stronger than those commonly reported in the literature, perhaps because this is the first study to use panel data at the neighborhood level. "As the geographical area over which the firm chooses its location gets smaller, alternative locations become closer substitutes. Hence, policies [or highway investments] may have stronger effect within a metropolitan area than they have within a state or broader region."

## Cervero (2003)

Using data for 24 California freeway projects across 15 years, Cervero explained traffic increases in terms of both faster travel speeds and land use shifts that occurred in response to adding freeway lanes. Figure 4 shows elasticity values from his longer-term path analysis. The share of countywide building square footage and valuations along a corridor increased with the share of countywide freeway lane mileage added 3 years earlier. Building activities were also highly responsive to average operating speeds 2 years before. Evidently, lane-mile additions in previous years, confirmed by increased travel speeds, spurred developers to build housing, offices, and retail stores near improved freeways. Consistent with theories of "highest and best use," offices and public buildings appeared to value accessibility benefits conferred by freeway expansions more than industrial uses. Prior-year gains in travel speeds, but not lane-mile additions, spurred retail development.

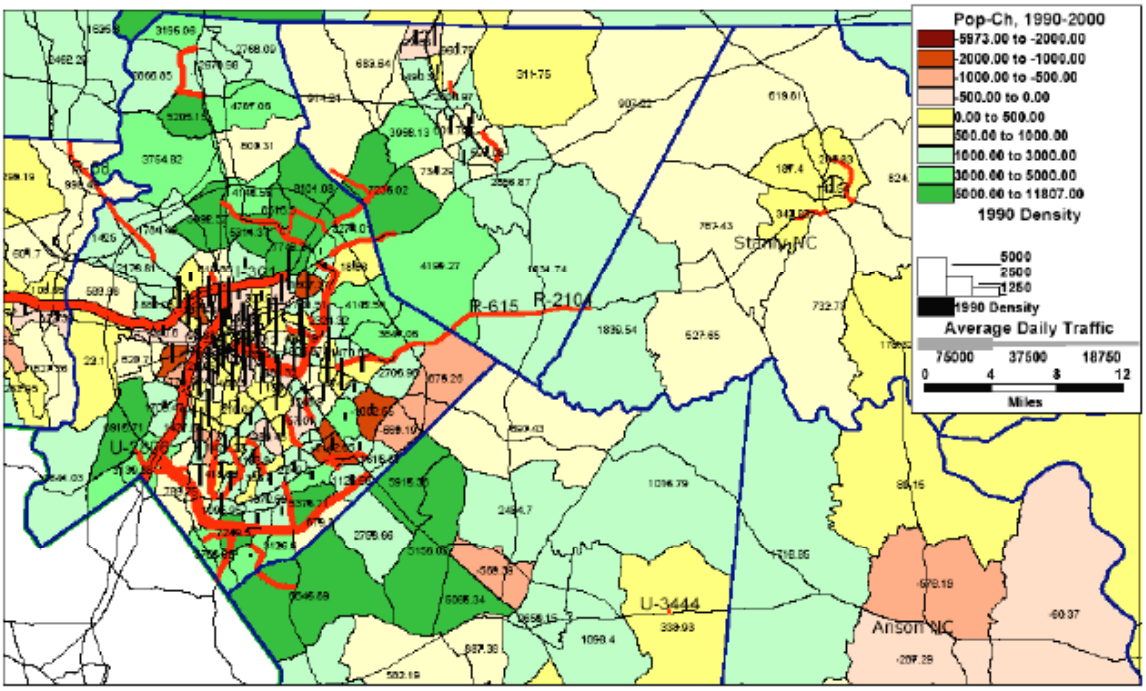
Figure 4. Longer-Term Path Model Summary




## Hartgen (2003)

Hartgen studied the growth of North Carolina's 1551 Census tracts during the 1990s in relation to the location of 312 major road projects. "Major road projects" were defined defined broadly, even including widening of 2-lane arterials and creation of one-way pairs. Growth went where there was room for it, filling in urban tracts and lower-density edge tracts. Road improvements increased tract decade-long growth by 50-550 persons per decade per mile of investment, about 2-14 percentage points above the baseline decade growth rate. The effect of road improvements on growth was greatest in Charlotte, North Carolina's largest city (see Figure 5). However, relationships were generally weak, explaining only about 15-25 percent of the variation in growth and suggesting that other, uncontrolled factors were at work (e.g., schools, taxes, sewer and water, taxes, community receptiveness).

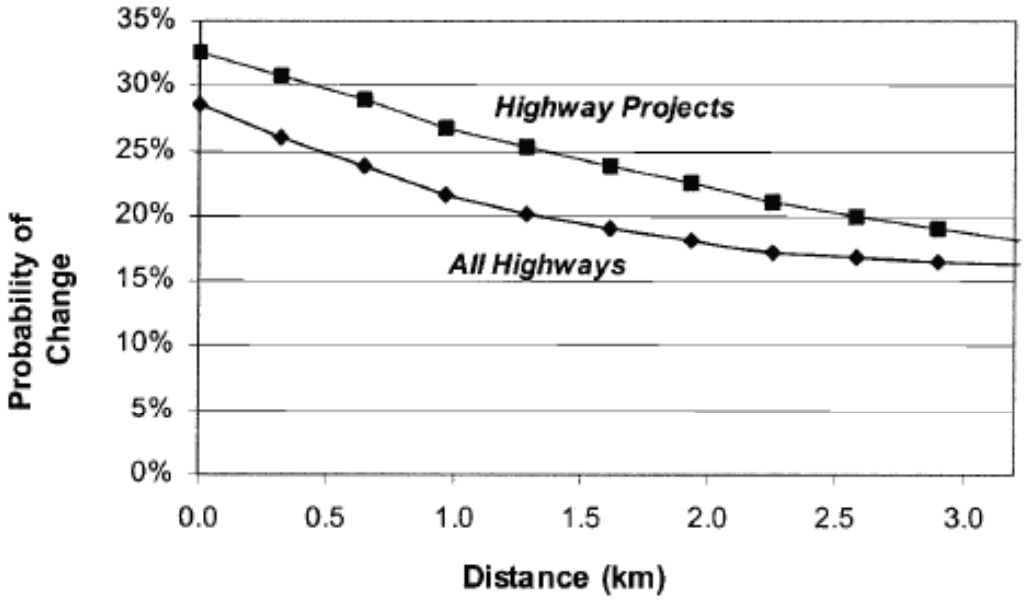
Figure 5. Population Change and Major Road Projects 1990-2000, Charlotte Region




## Sanchez (2004)

Sanchez studied whether highway projects in 15 Oregon cities induced conversion of land to urban uses between 1970 and 1990. Aerial photography was used to delineate the extent of urban development during the 20-year period. A logit regression model related the likelihood of land conversion to distance to the nearest highway, distance to the nearest state highway project, years since the highway project was completed, distance to the city center, zoning classification, city size, and population growth rate. The results suggest that for the 15 cities, the likelihood of urban development declined with increasing distance to the nearest highway, declined with distance to a state highway project, and increased with years since the state highway project was completed (see Figure 6).

Figure 6. Likelihood of Development, 1970-90



## Ryan (2005)

Ryan examined the effect of access to highways and light rail lines on office and industrial property rents in the San Diego metropolitan area between 1986 and 1995. Three variables measured access: straight-line distance of each property to the closest freeway on/off ramp; straight-line distance of each property to the closest light rail transit station; and, straight-line distance of each property to the central business district. Results indicated that access to highways had a significant effect on office rents, while access to light rail did not. Neither type of access produced a premium in industrial rents. Preliminary conclusion: while freeways provide clear access benefits for office firms, access to light rail transit and to the CBD is only valued when it coincides with significant, preexisting centers of like-activity.

## Berechman et al. (2006)

Berechman et al. estimated econometric models for counties and municipalities in the New York-New Jersey metropolitan area using longitudinal data for 1990 to 2000. State-level models were also estimated but are not relevant here. The models were production functions with output as the dependent variable and labor, private capital, highway capital, and unemployment as independent variables. Highway investments were found to have positive and statistically significant impacts on output at county level but not the municipal level. As the geographical scale gets smaller, spillover effects of highway investments into neighboring areas get larger. When time lags were applied to highway capital, the coefficients associated with that variable became smaller, suggesting that output responds immediately to highway investments (or may even anticipate highway investments). Output elasticities with respect to highway investments were 0.34 and -0.01 for counties and municipalities, respectively.

## Jiwattanakulpaisarn et al. (2006)

Jiwattanakulpaisarn et al. analyzed the extent to which investments in highways contribute to employment using panel data for all 100 counties in North Carolina, in each year between 1985 and 1997. Focusing on the actual impacts after the construction phase, they estimated models with the density of highway lane miles as an independent variable of interest and county private employment as the dependent variable. In a standard model with control variables and dummy variables for fixed effects, the relationship between highway density and employment was statistically significant. However, when lagged employment was added as an independent variable, highway density ceased to be significant. They conclude that omitting the dynamics of employment adjustment could lead to an overestimate of the effect of highways.

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# Appendix 2

## Survey of Growth Forecasts for the Region, With and Without the ICC.

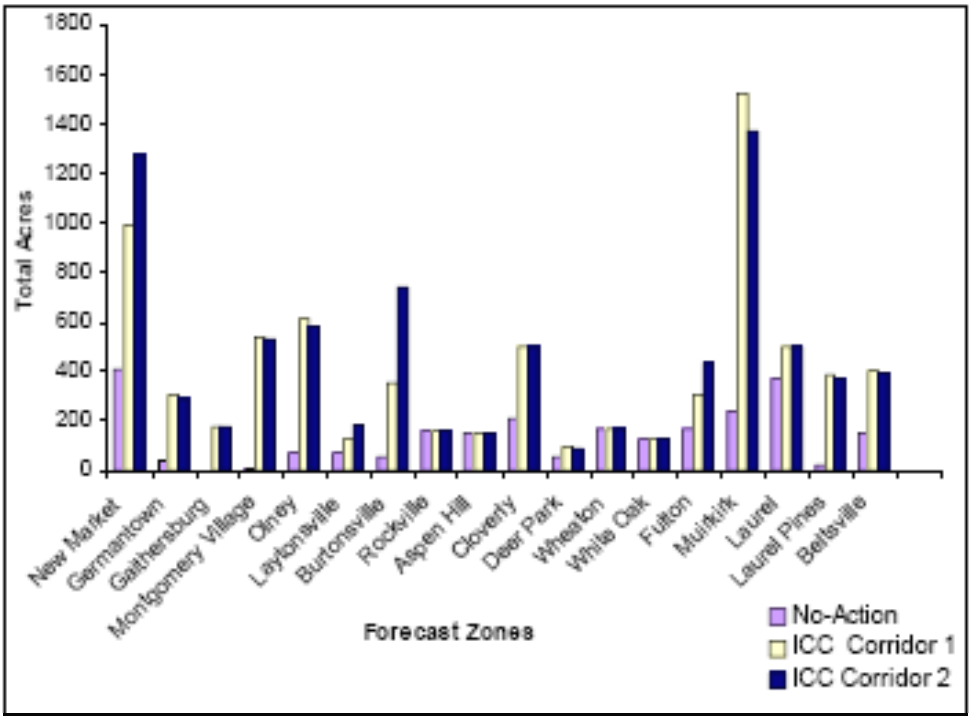
Investments in major transportation facilities increase the accessibility of locations near the facilities relative to the rest of the region, making these locations more attractive for development and thereby redirecting growth. The induced development means additional travel demand, which is loaded onto existing and new facilities and ultimately reduces the accessibility advantage of these favored locations. In time, these feedback ef fects result in a new equilibrium of land use and transportation, usually with higher vehicle miles traveled in the region and more suburban sprawl.

### ELUP Growth Forecasts

For this part of the study, we interviewed representatives of Metropolitan Washington Council of Governments (MWCOG), Baltimore Metropolitan Council (BMC), Maryland-National Capital Park and Planning Commission (M-NCPPC), Maryland Department of Planning (MDP), and others. From these interviews, we uncovered only one comprehensive forecast of induced development due to construction of the ICC. This forecast, based on growth allocations by the ICC Expert Land Use Panel (ELUP), is the forecast cited in the Final Environmental Impact Statement (FEIS) and the ICC Secondary & Cumulative Effects Analysis (SCEA). The following discussion focuses on the ELUP's forecast. After that, two other potential sources of data on induced development are briefly referenced.

Working with ELUP growth allocations, the FEIS and SCEA peg the amount of induced development with the ICC at 4,945 acres for Corridor 1 and 5,546 acres for Corridor 2. These acreages are beyond what is expected in new development without the ICC. Acreages for forecast zones seeing the largest increases in development with the ICC are shown in Figure 1.

Figure 1. Total Acres of Development by Forecast Zone (with and without the ICC)




Source: FEIS, 2005, p. IV-402.

The aggregate induced development numbers in the previous paragraph mask deep divisions within the ELUP. The SCEA describes divisions this way:

> *The ELUP was comprised of 15 individuals, all of whom had their own viewpoints and opinions. For the purposes of the SCEA, results from all 15 individuals were processed into one representative allocation per forecast zone (one household and one employment) using a statistical average. This statistical average does not always allow for individual panelist viewpoints and opinions to be clearly represented. Potential development acreages that were derived from the ELUP estimates are to be viewed more as projections of general development trends, rather than specific predictors of potential development.*

The idea of an ELUP is to bring together knowledgeable people with different perspectives and expertise, who through a deliberative process, eventually agree on a "consensus" forecast. The consensus is supposed to be reached through briefings by agencies on baseline conditions; discussion and careful consideration of available data; independent forecasts by panelists with written justifications; tallies and summaries of individual panel forecasts distributed to panelists; discussion and defense of individual forecasts; careful reconsideration of forecasts by individual panelists in light of others' forecasts and justifications; a second round of independent forecasts, more discussion, etc. until a consensus is reached.

The expert panel process may work well for other highway projects (Seskin et al. 2002). But for the ICC, the process did not result in convergence or consensus (Ewing and Kuzmyak 2005). Possible reasons may include (1) the scale of the project and size of the affected area, (2) the complexity of regulatory and market conditions, (3) delays in dissemination of key information to panelists, and (4) preconceptions and positions of panel members coming into the process (Ewing and Kuzmyak 2005; Gorham 2005).

Specifically, three panel members, concerned about the subjective and ad hoc nature of the panel's forecasts, collaborated on the development of a simple land-use forecasting model, which they tempered with expert judgment. The modelers' growth forecasts for the entire study area were higher than the other panel members'. The modelers predicted greater impacts (both gains and losses) for the Southern Alignment than Northern Alignment. The rest of the panel's forecasts showed the opposite.

Figures 2 through 7 present individual growth forecasts for select counties by the 15 panel members (build relative to no-build). These figures illustrate the deep differences between intuitive forecasts based only on expert opinion with those based on a formal land-use model informed by expert opinion. The three panelists who collaborated and relied primarily on modeled results were panelists 3, 8, and 15. Where zero values are shown, panelists assumed no difference between build and no-build alternatives.

In Montgomery County, where the ICC would seemingly have its greatest impact, the model based forecasts of growth in both jobs and households were about three times higher than those based on expert opinion only. Differences were not uniform across the county: the model predicted larger increases in jobs at locations near the ends of the ICC facility, such as Rockville, Gaithersburg, Germantown and Montgomery Village, and in places with an existing commercial character that would be given new direct access via the ICC, such as Wheaton, White Oak, Aspen Hill and Burtonsville. With regard to households, the model predicted increases in the interior of the county that have had limited accessibility in the past, such as Deer Park, Cloverly, Burtonsville, and Potomac. In these instances, the growth potential suggested by the accessibility relationships overwhelmed the existing zoning capacity for households, as many of these zones are currently zoned rural or agricultural. This caused the three panelists to moderately raise the zoning caps in these zones to accommodate at least some of the projected growth, while the other panelists were more likely to adhere to the existing zoning ceilings.

While differences between modeled and judgmental forecasts were significant in an order-of-magnitude sense for Montgomery County, the differences that showed up in the surrounding counties were even more pronounced. This is due to the fact that most panelists did not perceive much impact on development beyond the

corridor itself, whereas the travel time changes brought about by the ICC are much more widely distributed than intuition would suggest.

- For Prince George's County, panelists relying on expert opinion forecasted modest growth of households and jobs with the ICC. Using accessibility information, the modelers forecasted considerably larger increases. Much of the new growth would be located in the more suburban portions of Prince George's County, not in the older inner core, and particularly in places that would be well served by the ICC eastern extension into Prince George's County: Beltsville, Muirkirk, Laurel and Laurel Pines.

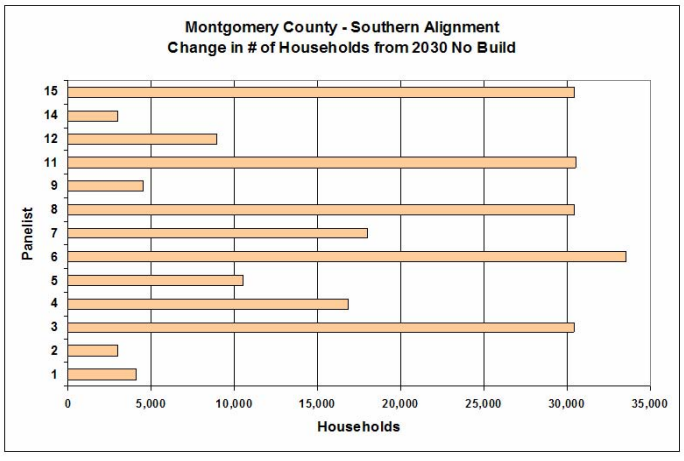
- Still heavily rural, Frederick County has grown rapidly over the past 15 years as job growth in the I-270 corridor and scarcity of affordable housing in Montgomery County have made living in Frederick County an economically attractive alternative. For Frederick County, most panelists felt that construction of the ICC in Montgomery County would have no effect on this trend. The model forecasted a large increase in households and jobs due to the ICC.

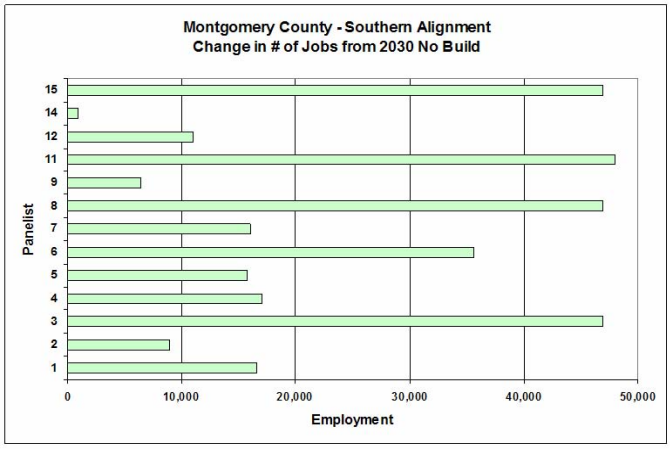
- For Washington DC, the existence of transit infrastructure and supportive development may mitigate the impacts of the ICC. Nevertheless, the model projected somewhat greater losses for the District than did the rest of the panel.

- For Howard County, the models forecasted greater impacts than expert opinion alone would indicate. This is likely due to the same phenomenon as in Montgomery County, where modeled forecasts reflect huge improvements in accessibility while judgmental forecasts appear constrained by existing zoning capacities.

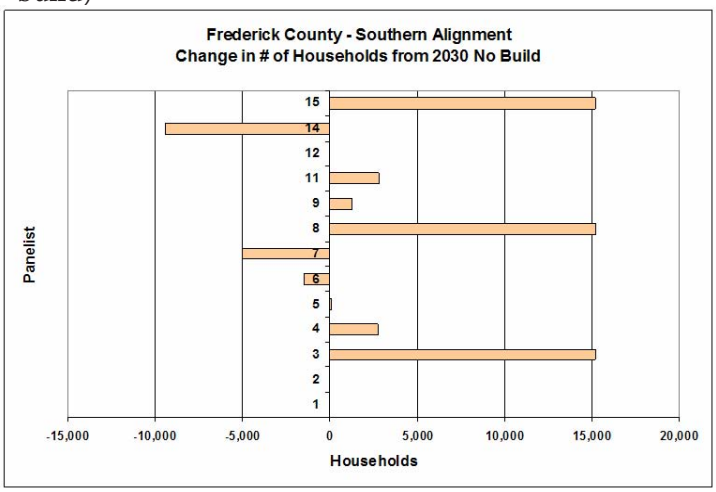
- For Anne Arundel County, the panelists forecasted additional households and additional jobs, while the model forecasted losses. This part of the region stands to lose in a relative and absolute sense as congestion increases on approaches to the ICC where highway capacity is limited and no highway improvements are programmed.

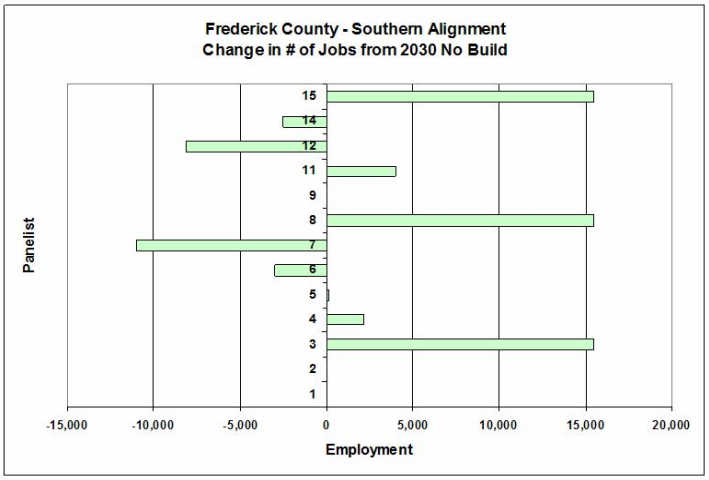
Figures 2 and 3. Forecasts of Households and Jobs for Montgomery County by Individual Panelist (relative to no-build)



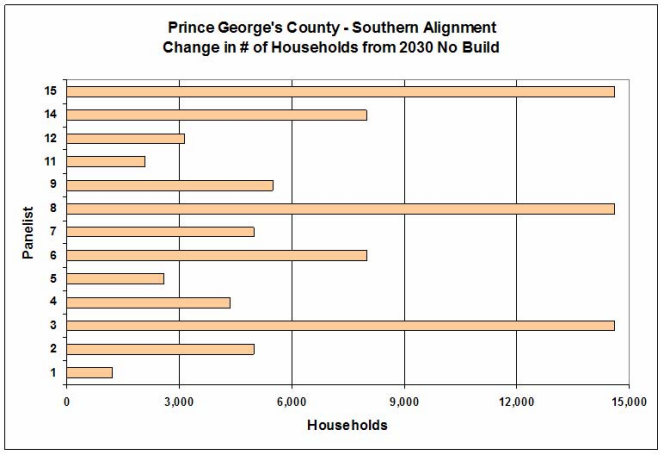



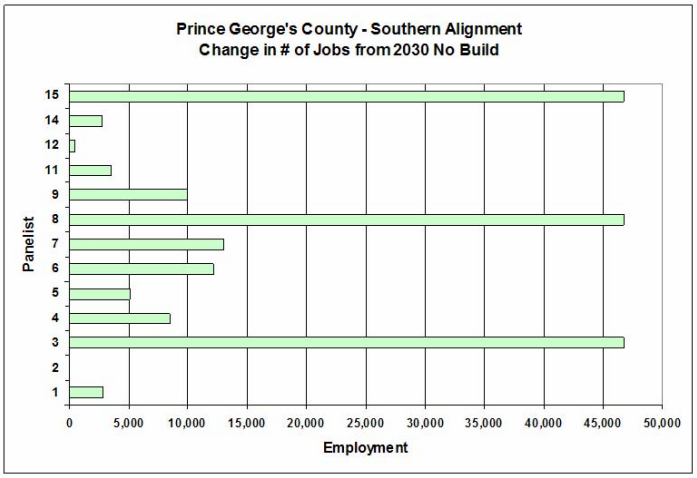
Figures 4 and 5. Forecasts of Households and Jobs for Frederick County by Individual Panelist (relative to no-build)




Figures 6 and 7. Forecasts of Households and Jobs for Prince George's County by Individual Panelist (relative to no-build)




## Lack of Integrated Modeling Capability

The three expert panelists who developed a simple land-use forecasting model used, as inputs, accessibility measures for base year and forecast years, the latter with and without the ICC. Accessibility measures were generated by the two MPOs using their conventional travel demand forecasting models. This was a low-tech example of integrated land-use and transportation modeling.

Such an effort on the part of private individuals was necessary because currently, in the Baltimore-Washington region, there is no integrated land use and transportation modeling capability. Hence there is no objective means of forecasting growth with and without the ICC. For a region this large, the absence of integrated modeling capability is remarkable.

Integrated model structures capture the interaction of land use and transportation in ways that the region's current ad hoc land use forecasts and conventional travel demand models cannot. Based on the experience of other large regions, and rumors of model development activities within this region, we assumed that some institution had developed or was developing an integrated model for this region or its component metropolitan areas. Interviews with the developers of integrated modeling software, with agency staff, and with academics, indicated otherwise.

The most widely used first generation model, DRAM/EMPAL, was never implemented in this region, and its streamlined successor TELEM has not been either. A second generation model, TRANUS, was to have been implemented by the Baltimore Metropolitan Council. A failure of the software developer to meet his contractual obligations put an end to this endeavor. BMC has hired another contractor to replace the first, but this contractor's third generation model, PECAS, will reportedly not be calibrated and validated until summer 2007. In any case, the BMC model will not cover the entire relevant study area for the ICC.

A trio of academics, involved with the Baltimore Ecosystem Study, had planned to implement another third generation model structure, UrbanSim. But the data requirements were daunting for anyone other than a large metropolitan planning organization like BMC or MWCOG, and the academics abandoned the effort.

MWCOG attempted to develop a first generation integrated model (actually, pre-first generation) with disappointing results. The model, EMPIRIC, was the first commercially available in the United States. It soured the agency on integrated models, and the agency currently has no plans to develop such a model.

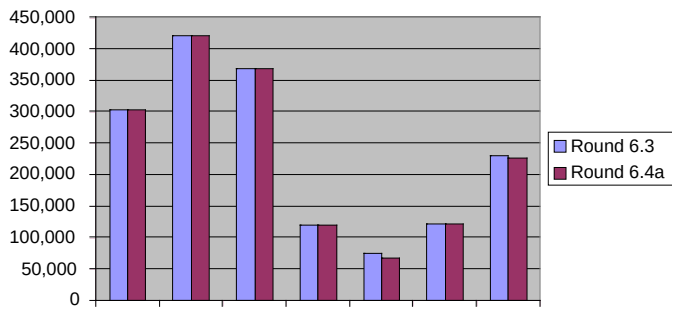
MWCOG acknowledges interactions between land use and transportation. Its Metropolitan Development Policy Committee is the fed the outputs of travel model runs for future transportation networks, and presumably tries to achieve a degree of consistency between land use and transportation in its cooperative future land use forecasts. Still, the current MWCOG cooperative forecasting process is, at best, a reflection of development trends and current local planning and zoning. It is also a political process as jurisdictions vie for growth and transportation dollars within MWCOG control totals.

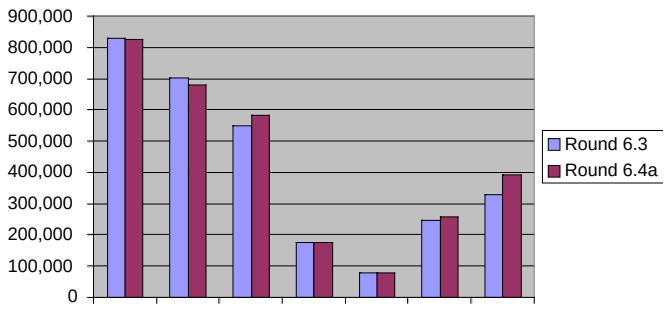
## MWCOG Cooperative Forecasts

The Round 6.4 forecasts generally did not assume construction of the ICC, except in the Montgomery County forecasts. Montgomery County has always assumed construction of the ICC, and the cooperative forecasts are essentially aggregations of county forecasts. In contrast, Round 6.4a forecasts did assume construction of the ICC, across the board. Thus, we could get an independent estimate of ICC-induced development by comparing forecasts for Round 6.4 and 6.4a, though without a true accounting of ICC impacts on Montgomery County.

Round 6.4a (11/04) forecasts are available on-line, as are Round 6.3 (10/03). Round 6.4 forecasts are not. We have done a simple comparison of the two available rounds to see if changes, at the county level, are significant. In Figures 14 and 15, Round 6.4a and 6.3 forecasts for 2030 are compared for counties within the ICC influence area. Changes in household totals are small and negative as population moves south out of the influence area. Changes in employment are generally consistent with expectations. Prince George's, Howard, and Anne Arundel counties are shown as gaining employment with the ICC. Montgomery County is shown as losing employment, presumably to stay within control totals. This is, however, an odd result since construction of the ICC would doubtless cause the northern counties in the region, including Montgomery County, to grow at the expense of the southern counties.

Figures 8 and 9. Change in 2030 Households and Jobs between Rounds of the Cooperative Forecasts



# Appendix 3

## Development Shifts within the Region after Previous Major Highway Investments

Interviews with representatives of multiple agencies uncovered only one post-construction assessment of induced development from highway improvements within the region. This was for I-270, which was widened in the late 1980s and early 1990s. In fact, in the Washington region, there has been more interest in the land-use impacts of Metrorail improvements than of highway improvements.

In 1999, the Washington Post ran a story comparing actual traffic volumes on I-270 to projections before construction ("Widen the Roads, Drivers Will Come – MD's I-270 Offers a Lesson," Washington Post, 1/4/99). The article declared the widening a failure based on the amount of induced travel, which effectively used up the added capacity. By year 2000, traffic volume for certain sections of I-270 already exceeded forecasts for year 2010.

This was a time of growing interest in the phenomena of induced travel and induced development. MNCPPC and MWCOG responded with a study and in 2001, a presentation that suggested that induced development was mainly responsible for the high and premature levels of congestion on I-270. Also blamed was the failure to build all transportation facilities in the adopted regional transportation plan of the time. Some projects had been delayed, and others dropped.

On the subject of induced development, MWCOG concluded that "higher observed traffic volumes relative to the 1984 forecast appear to be due in large part to shifts in population, employment, and travel to the I-270 corridor from other areas in the region, rather than to entirely new travel." For the region as a whole, population growth was 5% lower than had been forecasted in 1984, while employment growth was 9% higher. The two together suggested small (if any) net impacts of I-270 on regional growth.

However, population and employment had clearly shifted to the I-270 corridor, at the expense of other areas. Specifically, population and employment in the I-270 corridor were, respectively, 23 and 45% higher than forecasted in 1984. For all of Montgomery County, they were 7 and 21% higher than forecasted. Meanwhile, population and employment were 9 and 23% lower than forecasted in Prince George's County, and 29 and 3% lower than forecasted in the District of Columbia. These shifts in development are illustrated in Figures 1 and 2.

Figure 1. Difference between Actual and Forecasted Households by Subarea (2000)

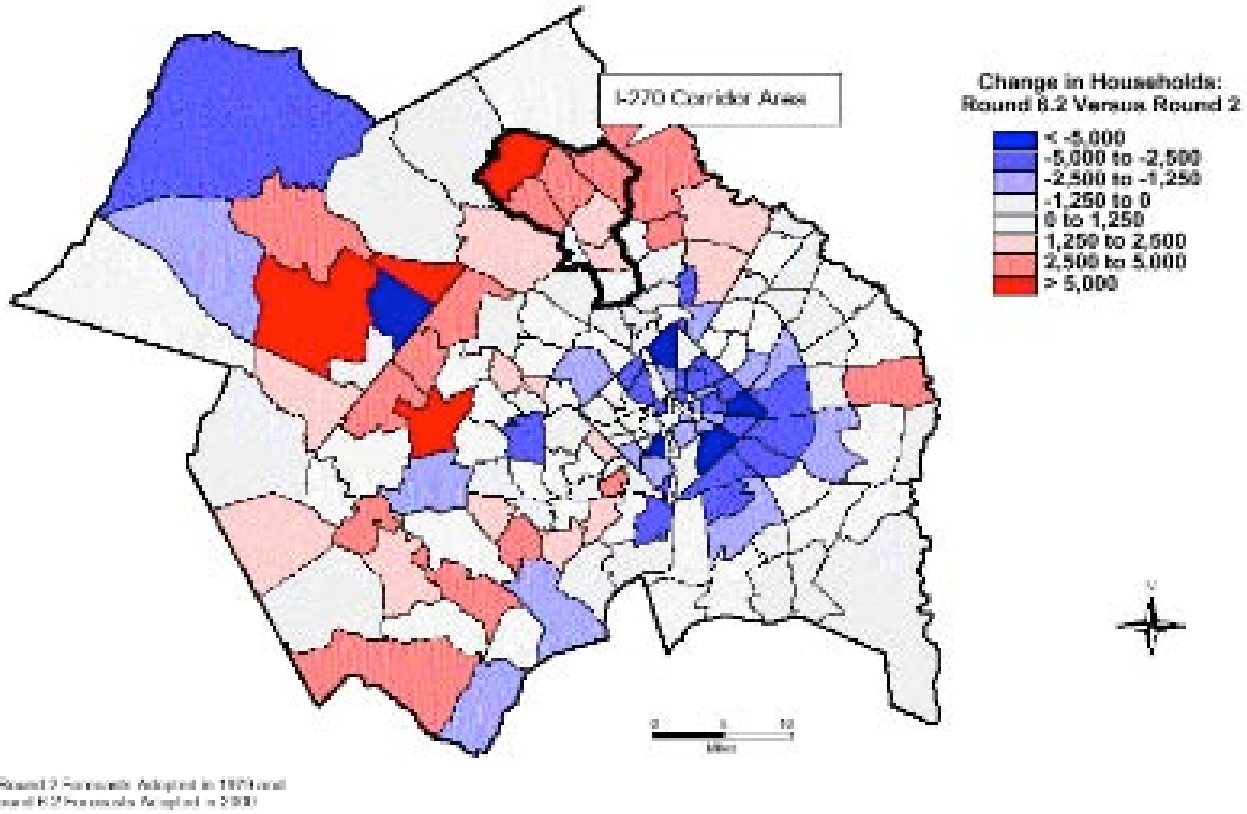
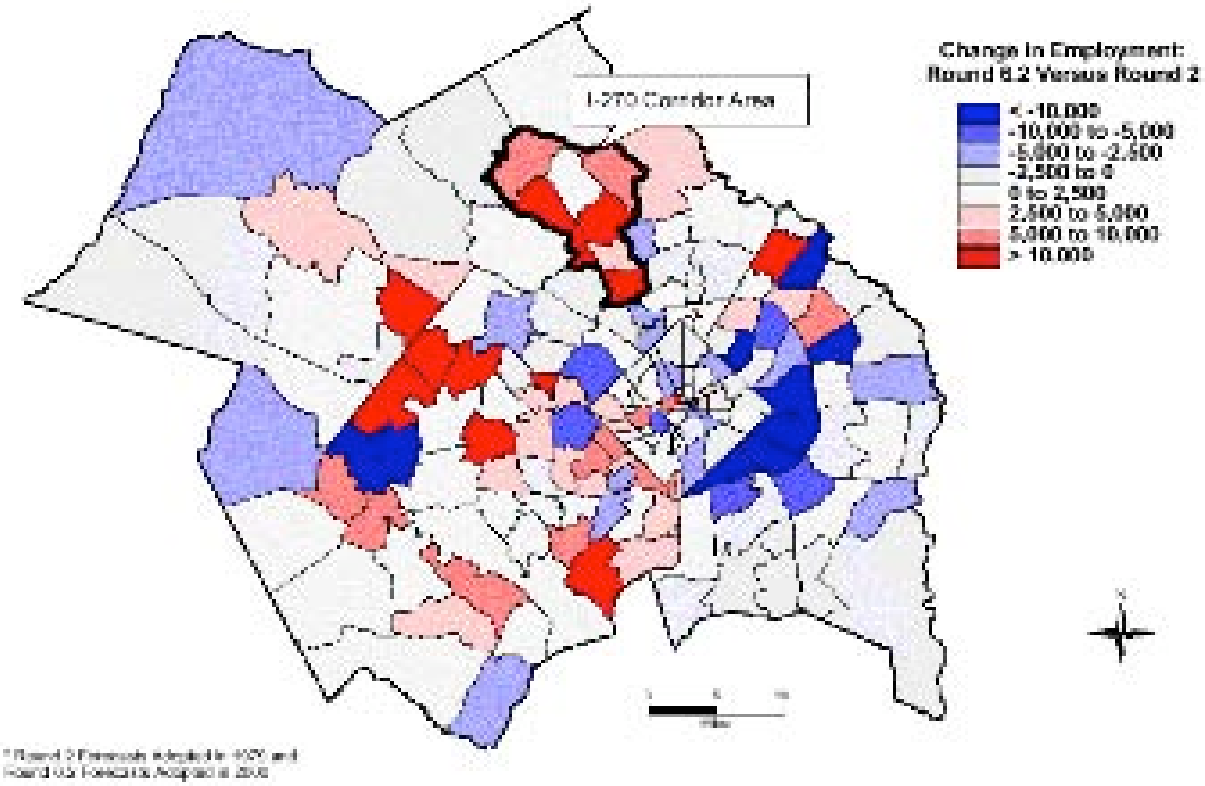



Figure 2. Difference between Actual and Forecasted Employment by Subarea (2000)



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