TRANSIT-ORIENTED DEVELOPMENT IN THE GREATER RICHMOND, VIRGINIA REGION

A CLIENT-BASED MASTERS PROJECT WITH
GRTC TRANSIT SYSTEM

by

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Abstract

Transit-oriented development (TOD) has been widely cited as a means of curbing emissions, increasing mobility and fostering sustainable economic growth. In difficult economic times, the need for creative and cost-effective methods of achieving these ends is even more pertinent. This two-part report aims first to inform policy-makers, planners, developers and all concerned citizens of the economic opportunities and broader benefits inherent in TOD. Secondly, it will provide an organization-wide TOD strategy for the GRTC Transit System (GRTC) as well as an assessment of the potential for Bus Rapid Transit (BRT) and TOD along the Midlothian Turnpike Corridor. This report thus aims to serve as both a comprehensive reference guide for TOD as well as a practical deliverable for GRTC and the Greater Richmond Region.
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Section I

Transit-Oriented Development: Room to Move & Improve
I. Motivation and Overview

Transit-oriented development (TOD) is a movement that is gaining momentum and importance. Like the electric car, it is not something entirely new, but rather something that already exists and requires systematic approaches to achieve widespread implementation.

TOD can be thought of as marrying land-use and transportation policy, harnessing the resulting synergies to create livable, walkable, and sustainable communities. Its underpinnings are straightforward: moderate- to high-density housing, with concomitant amenities within walking distance including public spaces, jobs, retail, all situated in mixed-use developments along strategic nodes of a regional transit system.

This translates into TOD being a high-value proposition by creating places with different types of transportation characteristics, which can in turn save money. However, TOD projects are complex undertakings, but the creation of mobility options is appealing since TOD has the potential to promote economic development, enhance real-estate value, and provide workers with more affordable access to their jobs and connect employers to broader labor pools.

Further, there is a link between TOD and economic resiliency, which adds a timely and strong argument for TOD in a recession. This is important since transportation represents the second largest consumer expenditure in the U.S. (19.1 percent of household income), urbanization rates are increasing (half of the world lives in cities, which will grow to 70 percent by 2050 on just 2 percent of world landmass), all of which implies that there is a significant opportunity for energy consumption reduction since urban energy consumption per capita is less than rural (Shaheen, Cohen, Roberts, 2005).

Despite record increases in public ridership, the U.S. is slashing service and raising fares. This is because many state and local governments are faced with decreasing tax revenues and increasing expenses. However, implications for the widespread implementation of TOD are not confined to the national realm, but also include global concerns. Internationally, by reducing gasoline consumption, transit projects will help to keep money in the local economy rather than sending it overseas to oil-exporting nations.

The first section of the paper represents a state of the industry of TOD so as to determine what TOD is, where it has succeeded and failed, and where it is heading. The paper will begin by outlining relevant definitional areas, with a heavy focus on environmental implications, and then proceed to an economic overview, best practices, problematic practices, stakeholder analysis, and a status update of the dynamic field of TOD.
II. Methods

For Section I, preliminary interviews were conducted in the summer of 2009 at the Rocky Mountain Institute (RMI). These included internal discussions with staff members and external elicitation of knowledge from experts. Most interviews consisted of 30-60 minute conversations over the phone with extensive note taking and interviewees are noted in the reference section. RMI asked for a state of the industry of transit-oriented development, which resulted in an extensive literature review including the last 20 years of journals by the American Planning Association, other journal articles, books and reports.

Eventually case studies were identified across the U.S., which included best and problematic practices of TOD locations as well as integral components of TOD. A summarization and comparison of environmental studies was undertaken to determine the relevant potential of TOD to reduce CO$_2$ emissions over various time frames. A barriers analysis was conducted to identify relevant hurdles that need to be addressed and overcome so as to achieve widespread implementation of TOD. Finally, a stakeholder analysis was executed to determine who was already involved in this sphere, what their goals and progress was, and where a transit agency should get involved.

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For Section II, expert elicitations helped gain perspective on the Richmond region and the challenges and opportunities associated with creating TOD and developing BRT. A comprehensive literature review of TOD financing mechanisms was incorporated into the strategic vision laid out for the client, and it serves as a valuable reference for TOD planners and builders.

Quantitative data analyzed for Section II includes raw ridership bus boarding and alighting data from the client and housing and labor statistics from the U.S. Census Bureau’s LED OntheMap web tool. This interactive web tool produced the shaded maps used in parts of Section II and found in Appendix C and D. Qualitative data analyzed includes observational data regarding business and infrastructure along the BRT study corridor, financing research regarding potential funders which can be found in Appendix B and E, and zoning research using the City of Richmond’s Parcel Mapper web tool.

The TOWS Matrix also served as a valuable qualitative tool to assess the outlook of both the region and the client’s desired study corridor and to propose strategies going forward.
III. Critical Concepts

A. Urban Planning

TOD can be a nebulous concept, but does have practical value and defining characteristics. As noted, TOD entails a veritable marriage between land-use and transportation planning, both of which have long been separated in this country. TOD consists of mixed-use districts with place and value creation along with vibrant street-life and pedestrian and bike accessibility to transit stops.

Despite recent shifts in attitudes concerning the auto-centric planning paradigm, there is still limited consensus on urban planning being cost-driven and people-centric. This paper will be looking at status and trends of TOD in America and so two cultural figures need to be attributed their respective historic weight: Robert Moses and Jane Jacobs, both oft-cited figures in the realm of land-use and transportation planning.

Moses was known for saying that cities are meant for traffic and commented as follows on President Eisenhower’s Interstate Highway in 1956: “This new highway program will affect our entire economic and social structure. The appearance of the new arteries and their adjacent areas will leave a permanent imprint on our communities and people. They will constitute the framework within which we must live.” (Harper’s Magazine, 1956)

Diametrically opposed to this point of view, Jane Jacobs repeatedly asked whether we are building cities for people or for cars? These two views have often found their respective philosophical abodes in traditional development and “New Urbanism.”

Peter Calthorpe, a new urbanism planner, defines TODs as, “… mixed-use districts within a comfortable walking distance of a transit stop and core commercial area (about 2,000-feet). A walkable environment makes it attractive for residents, visitors, and employees to travel on foot to transit and conveniences” (Jacobson and Forsyth, 2008).

A key concept in urban planning is development density. It has been generally noted that development density and transit usage are correlated. Bruun (2007) notes that a doubling of residential density in Chicago reduces annual distance travel per automobile by 32 percent and even reduces automobile ownership by 33 percent. Yet, the relationship between density and transit usage must also be nuanced with such matters as “walkability.” For example, a pedestrian may live in a dense neighborhood, but not use transit because walking is a preferred mode. Therefore, space consumption and all travel modes must be taken into consideration within land-use and transportation policy.

Some commentators believe that the U.S. is in the middle of a cultural paradigm shift with regards to development. According to Christopher Leinberger, a well-known thinker in this field,

“Gen Xers and Millennials want a lifestyle closer to Friends and Seinfeld (that is, walkable and urban) than to Tony Soprano (low density and suburban). It’s not that nobody wants Tony Soprano. About 50 percent of Americans actually do want that configuration. But if we’ve built 80 percent of our housing that way, that’s the definition of oversupply. The other 50 percent of
Americans want walkable urban arrangements and yet that’s just 20 percent of the housing stock. That’s called pent-up demand. So the market is just responding” (Leinberger 2009).

Tom Boone, TOD Manager at Denver Regional Council of Governments, believes there is entrenched behavior standing in the way of land-use and transportation planning being integrated. Behavior is hard to change and entrenched administrative procedures have led people to think in silos, both through careers and organizations (Private conversation with Boone, 07/14/09).

This “siloing,” or compartmentalization, may be overcome through goal setting. The traditional goals of land-use and transportation policies have often been framed in terms of congestion and are auto-centric. The relevant economic incentives, laws and organizations have long followed this model and have become entrenched. But with new types of crosscutting goals including livability, air quality, job creation, there may be room to move and improve.

Gerald Autler, coauthor of the influential Brookings Institutions paper “Transit Oriented Development: Moving from Rhetoric to Reality,” (Belzer and Autler 2002) and currently at the Boston Redevelopment Authority, believes that TOD deserves attention and policy, but believes once relevant actors begin thinking in terms of integrated land-use and transportation, the need to define TOD will to a certain degree become obviated. In other words, Autler suggests a bigger picture way of thinking about land-use and infrastructure is needed. The pertinent question becomes: how to capitalize on demand for people wanting to live in walkable and mixed-use areas? (Private conversation with Autler, 07/14/09)

“Node” and “place” are two planning concepts paramount to achieving a successful TOD project. A node is a point along a transportation network whereas a place is not only a point in a network, but exists as an integral part of a neighborhood. Variables accounting for “places” include proximity to mixed-use development, walking distance to housing, and other intangibles including parks and public spaces. The importance of places versus nodes is captured with the phrase “place making potential.” Later in the paper the main train stations in Denver and Washington, D.C. will be contrasted to highlight place making. Dittmar and Ohland (2004) note that, “A key node-place tension exists between the [transit] station’s role as an access point for people arriving by train, bus, car, bike, or foot, and its role as a vibrant, pleasant livable place.”

Often said to be the elephant in the room, parking is an essential planning aspect that merits attention. Traditional development parking ratios continue to be used for planning, which reflects an auto-centric bias and an assumption that people will always drive to a given location. Transit agencies are often forced to replace lost parking once a transit property (e.g., rail station) has been erected, which can undermine the TOD aspects of the project by hampering pedestrian activity through the generation of auto traffic.

The two most important steps to make sure that parking is part of a successful TOD strategy is to charge for parking and unbundle parking. Charging for parking may seem inherently problematic, but by not charging employees, employers are in fact already subsidizing their mode of transportation and encouraging them to drive. Second,
unbundling parking from the sale or lease of residential or commercial buildings is an important tool. Unbundling can lower the costs for tenants as well as reduce overall parking requirements for a given development. This point was made poignantly by adding the financial aspect, “If suburban office parking ratios had been applied to office buildings in downtown San Francisco or Manhattan, there would have been no loans made in these very profitable markets” (Dittmar and Ohland 2004).

Finally, the section turns to human-centric planning. This notion can be encapsulated in two planning strategies: complete streets and form-based codes.

“Complete streets” refer to streets with bike and pedestrian accessibility as well as room for mass transit. The specifics differ but the goals are the same: safety, accessibility and attractiveness. This in turn increases the so-called “catchment area” of transit, in other words, increases the area of potential transit ridership.

Form-based codes use physical form instead of separation of uses as the main principle for codes. These take the form of regulations instead of guidelines and are considered a progressive alternative to conventional zoning. Furthermore, zoning can be done in a customized fashion so that the relevant standards being promulgated are better suited for TOD. A way to achieve this is to streamline zoning is by minimizing discretionary review, which can greatly speed up the approval and development process. In a TOD, zoning provisions should promote “the ABCs: active, walkable streets, building density and intensity, and careful integration of transit” (Dittmar and Ohland 2004).

Because TOD entails the aforementioned concepts, it is both hard to succeed with a give project due to the many factors that must be taken into account, yet this also implies that there are many tools for achieving the goals of a TOD project, be it livability or increased mobility. In the end, TOD and the demand-side management of energy may become viable, low-hanging fruit pursued by a multitude of interest groups.

B. Public Transit

As this paper will demonstrate, thinking about land-use and transportation policy separately is a detrimental strategy to achieving TOD and its concomitant benefits, including public transit usage. The paper now turns to the second half of the equation: public transit.

This paper will take an inclusive tack on public transit and will consider bikes, walking, buses, light-rail, metro, and other types of transportation to highlight that mobility is the underlying need and demand, not a specific type of transportation system. Communities should choose the transit system that best fits their goals and not cherry-pick technologies.

Robert Cervero at UC Berkeley, a longtime thinker on transit, has concluded that transit should be planned in corridor-form since that is how we travel and how development expands. He has also found that transit changes market dynamics with new access (Cervero et al. 2004).
Similarly, TOD are not islands, they must be planned and designed as part of larger sub-regional system. Examples of good TOD design and implementation include Curitiba, Brazil, Portland, Oregon, and Stockholm, Sweden. Vehicle Miles Traveled (VMT) has actually declined in these cities, bucking global trends. Stockholm is especially interesting since it has a relatively high level of car ownership (555 cars/1000 inhabitants) yet most use public transportation for commuting and cars for shopping and weekend trips.

Several recent examples in the U.S. showcase progress as well as diversity in the public transit realm. Environmental Defense Fund’s (EDF) report “Reinventing Transit” (EDF 2009) demonstrates that transit does not have to be slow, unreliable, nor exclusive to urban centers. Literature suggests a chicken-and-egg dilemma with public transportation and ridership: either public transit works where there is a high ridership rate, or a good public transit system draws in people and thus leads to a high ridership rate. As the recent examples of public transit systems in U.S. suggest, if you build it, they will ride. The interrelationships between transit usage and its primary characteristics are graphically represented in Figure 1.

**Figure 1**

The first transit system examined is that of Eugene, Oregon. Eugene’s bus ridership has increased 35-40 percent in the last three years, which exceeds 20-year projections. Eugene’s system is a bus-rapid transit (BRT). A survey among riders revealed that almost 64 percent of riders that had chosen the BRT (EmX) had a car they chose not to drive (EDF 2009). This underlines the point that the end goal is to create mobility options and give people the ability to choose transit modes instead of picking favorites. These needs can be met through innovation by low-tech and flexibility.

Research shows that quality of service and reliability strongly correlate with transit demand and usage (EDF 2009). EDF found that the economic implications are very important since “...investments that expand transit provide more and longer-lasting jobs...
than investments to expand highways, while boosting economic development, enhancing real estate values and helping relieve consumer reliance on foreign oil” (EDF 2009).

Ridership has in fact exceeded projections in many public transit systems. There are several reasons for this; the two most widely are the Braess Paradox and induced demand. While many factors contribute to traffic growth, studies show that adding new road capacity leads to more driving over the long-term, contributing to additional growth in transportation emissions.

Braess's paradox explains why adding extra capacity to a network – when the moving entities selfishly choose their route – can in some cases reduce overall performance.

Induced demand explains why an increase in demand of a good takes place disproportionately to an increase in supply. For example, people within a half-mile radius are 5 times more likely to walk to a major transit stop than others. Those who live further from a transit node are less likely to bother with the train or bus. In other words, all components of a system need to taken into account and accurately forecasted to have better information when considering a transportation investment.

The second transit system examined by EDF exemplifies this point. The expansion of the Orange Line BRT in Los Angeles is expected to “...create 210,000 new jobs and $32 billion in economic output over the next 30 years” (EDF 2009). In fact, TOD is beginning to crop up all along the Orange Line BRT. This economic growth is not only a well-received side benefit to the project, but can also be used as a potential selling point for any TOD project.

As mentioned, public transit need not be limited to light-rail and BRT. For example, Prince William County Virginia’s OmniLink Bus is a flexible suburban bus, perfect for fitting a specific need. “In 2006, 59% of riders used the service to get to work, and 23% said they would not be able to get to their destination otherwise” (EDF 2009). Also, Kings County Area Public Transportation Agency in California has vanpools, which have the potential to supply the demand for rural transportation in the United States. Shoulder-lane buses in Minneapolis similarly illustrate flexible infrastructure. Public perception of the buses is positive with 95 percent of riders believing they save time and 65 percent recommend the service to others. This is an example of not only flexible infrastructure, but of infrastructure that can provide mobility options without road expansion (EDF 2009).

Bicycles are an underappreciated mode of public transit, which can be more innovative than often presumed. As Figure 2 below demonstrates, there is a lot of potential for bike stations to provide additional mobility options and reduce VMT. Bike stations are not just places to lock your bike but can also provide lockers and showers along with retail and additional services capitalizing on the place-making potential essential to TOD.
Finally, we turn to high-speed rail to tie it all together. The Passenger Rail Investment and Improvement Act of 2008 committed a historic $8 billion investment to high-speed rail in the United States. However, its global competitors have a significant head start and are vastly outpacing the U.S. in railway investments. For starters, the California high-speed rail (Proposition 1A) will alone cost $45 billion, so funding is severely lacking.

For the sake of comparison, Spain already has a high-speed rail network of 1,200 miles (traveling at 186 miles per hour) and will invest $140 billion in the next 10 years to expand network to 6,200 miles. In 2009, China announced that it will invest $730 billion in its railways (including high-speed rail) in the next four years (through the end of 2012) (wtvr.com).

To tie this international perspective in with TOD, consider Kenworthy and Laube’s (1999) findings,

“Overall, residents of denser, more transit-rich metropolitan areas pay less for transportation than their counterparts in auto-dependent metropolitan regions – even when the cost of public investments in transit is included in the calculation. In 1990, American cities spent 13.2 percent of gross regional product on transportation, compared to 8.1 percent in European cities and 4.8 percent in wealthy Asian cities.”

Despite all the promise and successes of public transit, it is important that funding follows planning efforts. No matter how much planning is done, funding must follow planning efforts; funding public transit through sales taxes is not sustainable because in a downturn, funding sources dry up. Therefore there is an identified need for a national strategy and priority setting (Private conversation with Boone, 07/14/09).

Public transit must be understood as containing a plethora of options that are not opposed to each other in a zero-sum game but instead part of a portfolio of mobility options. The popularity of public transit is underestimated due to induced demand and a general bias against it due to federal under-funding, which will be covered in the next section.
C. Legislation and Policy

The story of legislation and policy regarding transportation and land-use policy can best be conveyed by Figure 3 and Figure 4 below demonstrating that money is overwhelmingly flowing to highways.

Figure 3. Annual Federal Capital Investment in Highways and Transit

[Diagram showing annual federal capital investment in highways and transit]

Source: Baxandall et al. 2008

Figure 4. Cumulative Government Capital Investment in Transit and Highways Since 1956 (2006 dollars)

[Diagram showing cumulative government capital investment in transit and highways]

Source: Baxandall et al. 2008
This lopsided funding paradigm has troubling implications, which can be seen in the quadrennial infrastructure report card conducted by the American Society of Civil Engineers (Figure 5). Poor road conditions, structurally deficient bridges, under-funded public transit and ageing rail infrastructure are all growing concerns and stand as a reminder of the cost of doing nothing, or continuing with business as usual.

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However, a few key legislators and acts of legislation are worth following. The current Secretary of Transportation, Ray LaHood, tops the list. His understanding of addressing demand-side management of energy can be seen in the following quote,

“... even if we were to achieve a 55 mile-per-gallon fuel efficiency standard in the coming years, carbon emission levels from transportation would still only decline modestly. We must implement policies and programs that reduce vehicle miles driven” (http://fastlane.dot.gov).

Movements in Washington are moving in the right direction. The recent “Livable Communities” initiative, which forced the Environmental Protection Agency (EPA), Department of Transportation (DOT), and Housing and Urban Development (HUD) to work together, demonstrates the necessary systematic approach for achieving widespread implementation of TOD and increasing mobility options. This included $280 million in unallocated funds for urban circulators. Fundamentally, these livability principles are starting to show in other areas. To get federal transit funding as of January 13, 2010, you now need to demonstrate how your project will affect the environment as well as economic development.

The primary acts of legislation relevant to our purposes are listed below in Chart 1. The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 was in a sense, revolutionary. It put notions of “intermodality” as well as efficiency on the table. The Transportation Efficiency Act for the 21st Century (TEA-21) succeeded ISTEA and authorized additional funding for transit. The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) is its reauthorization. With guaranteed funding for highways, highway safety, and public transportation totaling $244.1 billion, SAFETEA-LU (2005) represents the largest surface transportation investment in the Nation's history.

Congress passed the third extension of the law authorizing the federal surface transportation program, which expired at the end of September. The old law remains in effect until the end of February 2010. It appears that a long-term authorization of a reformed federal surface transportation program will be in the waiting.
### Chart 1

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<td><strong>Intermodal Surface Transportation Efficiency Act (ISTEA)</strong> - 1991</td>
<td>Introduced intermodality, underscored importance of transit funding, gave powers to metropolitan planning organizations (MPOs)</td>
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<tr>
<td><strong>Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)</strong> - 2005</td>
<td>Important for allowing transfer of federal funds from highway to transit projects. Also, recognized that transit planners need to do more than analyze transit modes separately and only for a narrow range of impacts. (Bruun 2007)</td>
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In other relevant legislation, the H.R. 2454 Waxman-Markey bill should be mentioned since transportation planning is included in the legislation, even though only 5.12 percent of the act’s funding goes towards “Transportation Planning,” funds.

There is also the Clean, Low-Emission, Affordable, New Transportation Efficiency Act (CLEAN-TEA) H.R. 132, which would lower emissions from the transportation sector by setting aside 10 percent of funds generated from the auction of carbon emissions allowances from a future cap and trade climate bill to fund a Low Greenhouse Gas Transportation Fund. Earl Blumenauer, Congressman from Oregon’s 3rd district and well-known promoter of pedestrian and bike access issues, has promoted this legislation.

Besides Blumenauer, other key legislators that should be mentioned and followed for potential progress in this field include James Oberstar (Congressman and Chairman of House Transportation and Infrastructure Committee). House Subcommittee on Highways and Transit Chairman Peter A. DeFazio of Oregon joined Oberstar, who chairs the House Committee on Transportation and Infrastructure, and Senator George Voinovich of Ohio for speaking out against a delaying a transportation authorization bill.

There is a fundamental tension between transformation and time that is causing stimulus money to be poorly spent, according to some observers including Smart Growth America (SGA). They found that despite Americans driving less than ever, shovel-ready projects based on the old ways are being pushed forward. 30 percent of funds are going to new roads, 63 percent to fix decrepit transportation infrastructure, and only 0.9 percent of money is being spent on public transportation projects (SGA 2009). A logistical contributor to this situation is that states were only given 120 days to come up with new projects, which is not transformational bandwidth. Another issue is that federal funding almost exclusively goes to capital expenditures and very little goes to operational expenditures.
Ultimately, though it is a small slice, an increasing share of infrastructure money is being spent on public transit. The best news out of Washington is that housing and transportation are no longer viewed as mutually exclusive, evidenced by the aforementioned Livable Communities Initiative.

In the next section, the paper looks at not only what money is being spent, but asks how it is being spent and highlights concerns of distribution and equity.

D. Equity

First, a definition of the difference between accessibility and mobility to better understand the topic itself. According to Oregon’s Department of Transportation,

“Cities and other major activity centers tend to have a relatively poor vehicle mobility (due to congestion), but are economically successful due to excellent accessibility (activities that are clustered together and many travel options). This indicates that in the game of economic competitiveness, accessibility trumps mobility” (ODOT).

As hinted by this passage, there are economic costs to sprawl that are poorly understood and poorly conveyed. Research done by Environment Colorado Research & Policy Center (ECRPC) found that sprawling development generates less in tax revenue than the costs it incurs. This leads to local municipalities fiscally overextending themselves with their taxpayers paying for the consequences with the financial burden of providing new infrastructure and public services to sprawling developments. The study found that, "dispersed rural residential development costs county governments and schools $1.65 in service expenditures for every dollar of tax revenue generated" (ECRPC 2003).

The study found that it is cheaper to provide public infrastructure and services to populations living in smart growth or infill developments as compared to sprawling development. Because sprawling developments are dispersed and less efficient, they require more roads as well as utility services. These costs are also imposed on police and fire departments and schools.

Research by the Denver Regional Council of Governments (DRCOG) “...in the planning process for the Metro Vision 2020 update found that sprawling development would cost Denver-area governments $4.3 billion more in infrastructure costs than compact smart growth through 2020” (DRCOG Metro Vision 2035 Plan, 2007).

These economic implications of land-use and transportation policy are often overlooked, not to mention the social justice and political aspects, which need to be taken into account. There is however organizational potential in the deleterious aspects of sprawl, since an “Immobilized Class of America” – which theoretically represents a significant percentage of the population – may organize and form a new, powerful political interest group.

Key mobility concerns for this group include increased access to transit, increased ability to use it, and increased safety. In the U.S., less than one-fifth of all households have access to adequate bus or train service, and more than 32 percent of the population do not
have driver’s licenses (FHWA 2003), but even more pressing concerns are for those who are unable to drive, as well as those that cannot drive well or safely, but lack options.

These concerns add justice and equity factors to the TOD equation that need to be addressed. Chief among concerns is that those who cannot afford to pay for a car are those who must pay the socialized cost of sprawl.

Who bears the cost of sprawl? Identified groups include:

- Low-income
- Minorities
- Immigrants
- Children
- Elderly
- Special-needs

Moving into sociological territory, it is important to understand demand if one is to practice demand-side management of transportation and energy use. Reconnecting America compiled some telling trends on this very issue (Poticha 2006):

- According to Professional Builder, 37 percent of households want small lots and clustered development
- According to one AARP study, 71 percent of older households want to be in walking distance of transit
- A 2004 National Community Preference Survey revealed a preference for shorter commutes, living in or close to a city – especially among homebuyers
- The Wall Street Journal notes that the 2005 median sales price for condos tops price of single-family homes for first time; 9th consecutive year of record condo sales

This paper notes that cars are not always vehicles of freedom, as often thought, but too often, prisons. Because without a car, in many parts of America, you cannot get around, which translates into a crippling lack of accessibility. This lack of accessibility means not being able to get to one’s job, among other destinations, which is not only detrimental to the individual but to the economy as well.

In conclusion, an analysis of equity issues reveals an overlooked “Immobilized Class” with several pertinent concerns, which need to be addressed for the successful execution of TOD. Relevant to those concerns, the paper now turns to health issues including safety and security topics.

**E. Health**

TOD brings environmental and health benefits that are often neglected. In fact, a decline in physical activity levels across the world is one of the reasons scientists are projecting a doubling in global cancer rates over the next 40 years, and for this reason cities should become more like the bike- and bus-friendly Colombian capital of Bogota, at least in their transport policies, noted Professor Martin Wiseman in a recent BBC column, who is a medical and scientific adviser at the World Cancer Research Fund (BBC 2009). He says
following the South American city’s example would help prevent cancer by having widespread safe walking and cycling routes throughout the country. In fact, during the first year of operation for Bogotá’s BRT system, air pollution went down 40 percent.

The detrimental effects on quality of life are hard to dispute and unwise to neglect. Scientists estimate about a third of the most common cancers could be prevented if people ate healthily, maintained a healthy weight and were regularly physically active. According to the U.S. PIRG Education Fund, additional walking associated with taking public transit could save $5,500 per person in medical costs over a lifetime by reducing rates of obesity. Further, tailpipe emissions are linked to health problems including heart disease, lung development, and even lower IQ levels in children.

The following numbers tell a more vivid picture:

- Each year, 43,000 Americans are killed in motor vehicle crashes and 2.7 million people are seriously injured in more than six million motor vehicle crashes, which is now the leading cause of death for Americans aged 5 to 44 (Litman 2005).
- Transit-oriented urban regions have significantly lower per capita traffic fatality rates than more automobile-oriented cities. If residents of transit-oriented regions had the same traffic fatality rate as automobile-oriented, there would be about 2,500 additional traffic fatalities in the U.S. (Litman 2005).
- 185 die in public transit accidents a year. More importantly, transit-oriented urban regions have significantly lower per capita traffic fatality rates than more automobile-oriented cities. In fact, U.S. transit passengers have about one-tenth the traffic fatality rate as automobile occupants (Litman 2005).
- Accidents and traffic delays cost Americans more than $365 billion a year – $1 billion a day – or $1,200 for every man, woman, and child in the nation (Litman 2005).
- The federal government spent $22 billion, more than $9 per passenger, on air transportation security after than September 11, 2001 attacks, but less than 1¢ per passenger to increase railway and subway security (Howitt and Makler 2005).

Furthermore, the numbers cited above are lower-bound estimates because they assume that each transit passenger-mile replaces just one automobile passenger-mile. However, when people shift from driving to transit they tend to reduce their annual mileage, because transit users often choose closer destinations and avoid unnecessary trips. As public transit ridership increases in a community, per capita vehicle ownership tends to decline and land use patterns become more accessible and walkable, further reducing vehicle mileage. As a result, each transit passenger-mile often replaces several automobile vehicle-miles (Litman, 2005). This is one of the reasons that increased per capita transit ridership provides such large reduction in per capita traffic fatality rates, as indicated earlier.

There is also an important media aspect to risk and safety. Transit risks and accidents tend to receive more attention than automobile risks and accidents because they are rare. Incidents that kill or injure transit passengers often receive national or international media attention, while fatal automobile crashes are so common they are considered local news, and injury accidents often receive no media coverage at all.
There are vast health benefits to transit-oriented communities, or to put it more humanely; there are lives that can be saved. There is also great potential for avoiding injuries as well as health costs from tailpipe emissions through the promotion of TOD.

**F. Environment**

The transportation sector is the second-largest and fastest-growing contributor to global warming in the United States largely because the U.S. has designed the vast majority of its communities in ways that give people no other option but to drive everywhere. Public transportation obviates carbon dioxide emissions due to its relatively efficient carbon intensity as seen below (Figure 6).

Compact development patterns reduce carbon emissions from automobiles by up to 10 percent, compared to typical sprawl-type developments (ULI 2007). Public transportation in the United States already saves an estimated 6.9 million metric tons of carbon dioxide each year. Figures 6 through 8 tell a more complete story.

**Figure 6** describes the carbon intensity of transportation modes in the U.S., which demonstrates that transit is a more effective mode for reducing CO\textsubscript{2} emissions. It should be noted that transit would be even more efficient with higher ridership. **Figure 7** describes GHG emissions by transportation mode in the U.S. As can be seen, a stunning 83 percent of CO\textsubscript{2} emissions come from trucks and cars and only 4 percent from rail and bus. Finally, **Figure 8** demonstrates how large of a share (69 percent) transportation represents for U.S. oil demand.

**Figure 6. Carbon intensity of transportation in the U.S.**

![Source: Federal Transit Administration (FTA), “Public Transportation's role in Responding to Climate Change,” January 2009.](image-url)
Assessment of Transit-Oriented Development as a Tool for CO$_2$ Mitigation

CO$_2$ mitigation through transportation policy is often discussed in terms of a three-legged stool: one leg represents vehicle efficiency, one the carbon content of the fuel, and one representing the oft-forgotten leg of reducing VMT. The section of this paper will survey the potential of transit-oriented development in the U.S. as part of the third leg.

This section is motivated by the fact that public transportation already reduces the nation’s carbon emissions by 37 million metric tons per annum (APTA 2009). If coupled with TOD, it is likely that the demand-side management of CO$_2$ emissions is not only underappreciated, but has greater and quicker potential than other alternatives such as electrifying our fleet.

The section will begin by outlining fundamental definitions and concepts including pertinent land-use policies, air quality consequences and the potential solutions for addressing these concerns. It will then delve into existing projects that have tied together land use, transportation, and air quality, and assess subsequent outcomes. Finally, the
section will synthesize recent national work and present a summary of relevant literature and a landscape-analysis.

**Definitions and Concepts**

Assessing the CO₂ mitigation potential of TOD is increasingly pertinent as pent-up demand is being revealed for compact, mixed-use and walkable locations that are connected by transit, all components that reduce VMT through TOD. Further, forecasts indicate that this demand will only grow. According to an influential report by the Urban Land Institute, *Growing Cooler: The Evidence on Urban Development and Climate Change* (ULI 2007), several indices support the claim that demand for TOD is increasing e.g., households without children will constitute nearly 90 percent of new housing demand in the coming decades and their preferences are for smaller units, more amenities, and transit within walking distance.

Transportation trends give further impetus for considering TOD. Currently, America’s transportation sector accounts for 33 percent of greenhouse gas emissions (Eaken and Goldstein 2008). Furthermore, scientific opinion, including the Intergovernmental Panel on Climate Change (IPCC), holds that the world must reduce emissions by approximately 20 percent by 2020 and 80 percent by 2050 to prevent the worst impacts of climate change, all of which will be impossible to attain with continuously increasing emissions from America’s transportation sector. The U.S Energy Information Administration (EIA) projects that America’s transportation sector will use 24 percent more energy for light-duty vehicles by 2030, with emissions of CO₂ increasing at a similar rate (EIA 2009).

Finally, to best understand TOD, it is important to differentiate between TOD, smart growth, and integrated land-use transportation planning. ICF International, an environmental consulting firm, defines TOD as falling within integrated land-use transportation planning (ICF 2007), but this paper utilizes a functional definition. Thus, TOD should be thought of as a design tool for achieving integrated land-use transportation planning. Smart growth is similar, but uses a suite of tools to achieve comparable results on a macro level. It describes the trend of redeveloping our urban cores with more compact, mixed-use, and transit-connected communities. To summarize, the goal is to reduce CO₂, the strategy is to reduce VMT through transportation demand management (TDM), and the tool being examined is TOD.

**Historical Precedent: The Land Use, Transportation, and Air Quality Connection**

Though several studies have attempted to quantify the potential for reducing VMT through land-use and transportation policies, the *Land Use, Transportation, and Air Quality* (LUTRAQ) study conducted in Portland, Oregon, is widely considered the most influential (1000 Friends of Oregon 1997). LUTRAQ was conceived of by a non-governmental organization, 1000 Friends of Oregon, reacting to the proposal of a new suburban freeway in the Portland metropolitan area. The so-called Western Bypass had great political support in 1988 when plans were moving ahead, and yet, in June 1997 the regional government put an end to the project. Conceptually speaking, a consensus evolved that Portland could not build itself out of congestion. Further, a lack of transit options, segregation of land uses, and an automobile-scale land-use policy left citizens
with little recourse but being beholden to an automobile-scale landscape.

In considering the freeway expansion, three options were considered: no-action, freeway bypass, or LUTRAQ. The bypass option was found to increase VMT over the no-build option by almost a million (5.6 percent), but would decrease by 3.2 percent with LUTRAQ. Further, under the LUTRAQ option, 33 percent of work trips originating in TOD would be by transit, foot, or bicycle. As Figure 9 demonstrates, LUTRAQ had considerable appeal by reducing VMT as well as reducing peak hour vehicle hours of delay (Bartholomew 1995). Similarly, Figure 10 demonstrates the change in travel mode options and auto ownership.

**Figure 9. Congestion and Vehicle Use: LUTRAQ vs. The Western Bypass**

![Graph showing congestion and vehicle use comparison](Source: Bartholomew, 1995.)

**Figure 10. Comparison of Standard Suburban and Transit-Oriented Development**

<table>
<thead>
<tr>
<th></th>
<th>Standard Suburban Development</th>
<th>Transit-Oriented Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto Ownership:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage of Homes Owning 0-1 Autos</td>
<td>29.4%</td>
<td>44.1%</td>
</tr>
<tr>
<td>Average No. of Autos/ Household</td>
<td>1.91</td>
<td>1.63</td>
</tr>
<tr>
<td>Work Trip Mode Choice:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walk/Bike</td>
<td>2.8%</td>
<td>5%</td>
</tr>
<tr>
<td>Transit</td>
<td>7.5%</td>
<td>28.2%</td>
</tr>
<tr>
<td>Carpool</td>
<td>14%</td>
<td>17.2%</td>
</tr>
<tr>
<td>Drive Alone</td>
<td>75.8%</td>
<td>49.6%</td>
</tr>
<tr>
<td>Vehicle Trips/Household</td>
<td>7.53</td>
<td>5.79</td>
</tr>
</tbody>
</table>

*Source: Bartholomew, 1995.*

Ultimately, LUTRAQ was adopted which reduced VMT by 8 percent compared to the business-as-usual scenario involving the highway expansion. LUTRAQ succeeded in part by working within the real estate market to address needs instead of manufacturing demand. LUTRAQ revolutionized transportation planning by challenging the prevailing
consensus that land use should not be taken into account when addressing transportation needs.

Tying VMT and CO₂ reductions together, LUTRAQ was found to reduce greenhouse gas emissions (GHGs) by 6.4 percent. This estimate was obtained by using the Environmental Protection Agency’s (EPA) data on carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) multiplied by travel-demand model outputs by Portland’s regional government. Finally, atmospheric dispersion models were employed to translate these outputs into atmospheric concentrations of said pollutants. Note that CO₂ makes up 95 percent of all transportation-related GHGs (FTA 2009).

The Three Legs

To better understand the land use, transportation, and air quality connection, it is key to disaggregate the variables to understand their separate effects. The potential for reducing CO₂ emissions through public transportation use has been suggested above, but for further evidence this paper looks at the Federal Transit Administration’s (FTA) recent report, Public Transportation’s Role in Responding to Climate Change (FTA 2009).

FTA acknowledges the role public transportation has in reducing emissions by “...facilitating higher density development, which conserves land and decreases the distances people need to travel to reach destinations” (FTA 2009). Behavioral changes are also accounted for with studies cited by FTA showing “...that for every additional passenger mile travel on public transportation, auto travel declines by 1.4 to 9 miles” (FTA 2009). As Figure 11 below demonstrates, public transportation produces far fewer GHGs per passenger mile, even more so when increased occupancies are considered. Heavy rail transit produces about 75 percent less GHGs per passenger mile compared to an average single-occupancy vehicle (SOV). Light rail produce 57 percent less and bus transit 32 percent less.

Figure 11

![Figure 11](source: FTA 2009)
On a regulatory note it is interesting to note that FTA does provide technical assistance in TOD projects because it believes that combining “(... investment in public transportation with compact, mixed-use development around transit stations has a synergistic effect that amplifies the greenhouse gas reductions of each strategy)” (FTA 2009).

With public transportation’s role established, the paper turns to urban spatial structure, which may be equally if not more important as a CO₂ mitigation tool. Brian Stone Jr., a professor at Georgia Tech, has done extensive work on the links between urban spatial structure and air quality with many relevant findings. In one study (Stone 2007), Stone looked at metropolitan regions and finds a relationship between higher sprawl and more ozone exceedances than more spatially compact regions.

Similarly, in another study (Stone 2003), Stone finds that emission controls on vehicles – the preferred mobile source air pollution controls strategy employed by the EPA – have been overwhelmed by increases in VMT and automobile ownership rates. On a regulatory level, EPA made a significant move in January 2001 when it issued new guidelines under which metropolitan regions can get emissions “credits” for adopting sustainable smart growth land use policies which focus on urban spatial issues.

Stone targets competing pollution control philosophies and jurisdictional parameters of the federal environmental management as pressure points for change. One such philosophical pressure point is that of means- versus ends-oriented approaches to air quality planning. Stone criticizes the current means-oriented approach to mobile source air pollution, pointing to the 1967 through 1990 Clean Air Act amendments requiring increasingly effective emissions control technologies from automobiles. The reason for the criticism lies in the paradox that though EPA has successfully reduced vehicle emissions rates by 90 percent between 1970 and 1999, total hydrocarbon emissions from the light-duty vehicle fleet only decreased by 31 percent. The cause for this discrepancy is singled out to be concurrent increases in VMT. Ultimately, Stone recommends that we address the reality that VMT growth has and will continue to outstrip population growth unless we change growth patterns themselves.

Stone concedes that a smart growth land-use may not necessarily result in a decrease in VMT – partially due to the failure to account for complementary policies including parking costs – but finds a strong enough relationship to result in a more effective implementation of emissions controls. Stone goes onto say that state and local governments can meet Clean Air Act requirements using “land-based” policies.

Recently, Stone et al. (2009) looked at a combination of three legs of transportation and assessed the potential for CO₂ mitigation through smart growth development as well as vehicle fleet hybridization. Assuming a lower resource use per capita in metropolitan areas, Stone points out that with future population growth projected to take place in urban areas, the potential for capitalizing on massive redevelopment may be at hand. Stone et al. cites another study (Nelson 2006) predicting, “…that approximately 50% of the built environment – streets, buildings, and parking lots – of U.S. cities in 2025 will have been newly developed or redeveloped since 2000. … [This redevelopment] presents an opportunity to measurably reduce per capita demand for these resources through more
compact, mixed-use, and transit supportive patterns of growth...”

Stone et al.’s paper models the effectiveness of smart growth development and vehicle fleet hybridization on reducing “... mobile source emissions of carbon dioxide (CO₂) across 11 major metropolitan regions of the Midwestern U.S. over a 50-year period,” through six scenarios between 2000 and 2050 including a business-as-usual (BAU) scenario, two smart growth scenarios (one more aggressive than the other, labeled SG1 and SG2), a hybrid-electric vehicle fleet scenario (HEV), and two combination scenarios including SG1+HEV and SG2+HEV scenarios.

Their results suggest, all else being equal, “...a doubling of mean population density throughout the median metropolitan area would have the effect of reducing vehicle CO₂ emissions by about 30% relative to the BAU scenario, while the full dissemination of conventional hybrid technology was found to reduce vehicle CO₂ emissions by 18%.” Furthermore, results suggest that “...high levels of urban densification could achieve reductions in 2050 CO₂ emissions equivalent to those attainable through the full dissemination of hybrid-electric vehicle technologies.”

Returning to the Urban Land Institute’s report, Growing Cooler: The Evidence on Urban Development and Climate Change (ULI 2007), we find that compact development could reduce the transportation sector’s emissions by seven to ten percent by 2050 (Figure 12). Ultimately, the various projections underscore the importance of incorporating VMT growth when considering GHG reduction strategies.

It is interesting to note that the high end of ULI’s estimate represents a modest 3.3 percent reduction in total U.S. emissions. However, this is largely due to a failure to take secondary benefits into account including indirect economic benefits. As Eaken and Goldstein point out, “...considering that Ewing et al project that compact development will save consumers $250 billion in fuel costs by 2030, in addition to billions in infrastructure cost savings projected to accrue to local governments, compact development presents a highly cost-effective strategy in terms of public and private dollars spent per ton of carbon reduction, particularly when considered in the context of other costly proposals to address global warming pollution” (Eaken and Goldstein 2008).
Summary and Landscape-Analysis

To synthesize and better comprehend results from studies relevant to this paper’s purpose, a literature summary is presented below (Figure 13). Based on the numbers below, a consensus can be approached, which holds that a combination of land-use and transportation policies can lead to a 7-25 percent reduction in VMT during a 20-year time horizon and 10-40 percent during a 40-year time horizon, with differences accounted for by political feasibility and level of implementation. Note that all studies concern the U.S. Certain studies did not specify a time period, which makes the timeline harder to discern. However, the NRDC study provides a good literature overview and reaches a similar conclusion to the one stated above.

Interestingly, the findings are not limited to a geographic location in the nation, nor do they suggest that TOD is the only way to reduce VMT. Instead, the summary below suggests that a suite of tools can be implemented including TOD and increased public transportation usage. Further, the literature to date has focused on potential results of reducing VMT, and to some extent the various tools. Little work has been done on what the next steps need to be so as to move ahead. Future work should take this into account and adopt a more practical approach to the subject.
Conclusion

Based on the studies reviewed, TOD has great potential in mitigating CO₂ due to projected increases in population growth, VMT and sprawl. In order to effectively employ emissions control strategies, it is time to consider not only technology-based approaches as previously done, but also systematic approaches involving land-use decisions. This is already occurring in scattered places around the U.S., but to fully harness the synergies of TOD, it is vital to overcome certain obstacles including an unsupportive regulatory framework as well as financing difficulties.

Stone (2003) notes that it is difficult to implement land-use policies on the state level because it is technically complicated, and sometimes politically unfeasible since an extremely protective behavior surrounds land-use decisions. To overcome this, a better indicator for land-use and transportation planning will be needed and will likely involve measures of sustainability to better capture effects of VMT growth instead of only trying to regulate tailpipe emissions. The assessment of TOD as a tool for reducing CO₂ emissions demonstrates its potential effectiveness, but remains to be widely implemented. Further studies should try to quantify secondary effects of TOD, which include improved health benefits and may increase its appeal and penetration.
IV. Industry Analysis

A. Economic Models & Cost Drivers

No matter the economic climate, the importance of TOD can best be conveyed through the dollar figures underlying TOD and ultimately, the unsustainable business-as-usual scenario currently being pursued. The relationship between housing and transportation costs is crucial to understanding current spending power and relating TOD to people on a personal financial level. The American family spends 32 percent of its household budget on housing and 19 percent on transportation. However, those living in dense, walkable, mixed-use neighborhoods with access to quality transit spent only 9 percent on transportation compared to 25 percent for those living in auto-dependent neighborhoods. As seen below, ICF International found that auto-dependent households spend $6,251 more per year than a public transportation household (Figure 14).

Figure 14. Annual transportation cost comparison for transit-using and auto-dependent households


The first household is a “public transportation household.” This household has two workers, is located within three-quarters of a mile of public transportation, has one automobile, and uses public transportation on a given day. The second household is the “no-service household.” This household lives more than three-quarters of a mile from public transportation, has two workers, two automobiles, and did not use public transportation on a given day.

These findings are increasingly important and may find impetus in the recent recession. “It’s the transportation and housing costs that really have to be taken into consideration and the spending impact of household incomes going into those two expenses. We’re in a recession primarily because people stopped spending, people don’t have money for anything else” (Private conversation with Boone, 07/14/09).
Similarly, the Center for Neighborhood Technology (CNT) has done an exhaustive graphical analysis of metropolitan areas in the U.S. and found several pertinent correlations. A graphical information systems (GIS) analysis demonstrates the importance of thinking about housing and transportation expenses together.

The following are key correlations resulting from GIS analysis using CNT data, which was executed by the authors:

- Better access to transit -> Lower transportation expenses
- Access to transit -> Access to jobs
- Less spent on housing and transportation -> Fewer CO2 emissions
- Better access to transit -> More workers use it
- Better access to transit -> Fewer VMTs
- Denser households -> Lower transportation expenses
- Shorter block sizes -> Lower transportation expenses

Breaking the economic costs into three tracks, a clearer picture emerges. Overall, for each $1 invested you get $2 in savings with public transportation (Figure 15). This is due to three factors:

- Parking Costs: Annual cost of providing parking is estimated to be as high as $500 billion per year, including the value of the land on which those parking lots sit (VPTI 2009).
- Congestion Costs: In 2007, congestion cost about $87.2 billion. Cost of logistics for U.S. companies has increased $412 billion in just four years. Accidents and traffic delays cost Americans more than $365 billion a year (Committee on Transportation and Infrastructure 2009).
- Transit Savings: $60 billion in public benefits vs. $31 billion in public investment (APTA 2009).

**Figure 15. Estimated annual cost savings from transit (billion dollars)**

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced consumer transportation expenditures</td>
<td>$24.2</td>
</tr>
<tr>
<td>Avoided congestion</td>
<td>$9.6</td>
</tr>
<tr>
<td>Carbon dioxide emission reductions</td>
<td>$0.6</td>
</tr>
<tr>
<td>Reduced road expenditures</td>
<td>$8.0</td>
</tr>
<tr>
<td>Reduced parking expenditures</td>
<td>$12.1</td>
</tr>
<tr>
<td>Reduced accidents</td>
<td>$5.6</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$60.1</strong></td>
</tr>
</tbody>
</table>

Source: Texas Transportation Institute 2009

As a result of not investing in transit, the total cost of logistics for U.S. companies has increased from 8.8 percent of Gross Domestic Product (GDP) in 2004 to 10.1 percent in 2008 – a $412 billion increase in just four years (Committee on Transportation and Infrastructure 2009). For instance, General Mills spends almost $650 million a year trucking hundreds of millions of cases of food to market. For every one mile per hour reduction in average speed of its shipments, it costs General Mills $2 million of additional logistics costs.
The Surface Transportation Policy Project estimates that investments in transit produce 19 percent more jobs than an equivalent investment in new road and bridge projects (APTA 2009).

In 2006, transit saved enough gasoline to fuel 5.8 million cars for a year, averting $9 billion in spending on gasoline. In the Chicago metropolitan area alone, 276 million gallons of gasoline were saved from transit service alone (Figure 16).

**Figure 16. Top 10 metropolitan areas in terms of gallons of gasoline saved and avoided gasoline expenditures from transit service**

<table>
<thead>
<tr>
<th>Urban area</th>
<th>Oil savings (million gallons)</th>
<th>Gasoline cost savings (million dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>New York-Newark, NY-NJ-CT</td>
<td>1,772</td>
<td>$4,639</td>
</tr>
<tr>
<td>Chicago, IL-IN</td>
<td>276</td>
<td>$723</td>
</tr>
<tr>
<td>Washington, DC-VA-MD</td>
<td>254</td>
<td>$666</td>
</tr>
<tr>
<td>San Francisco-Oakland, CA</td>
<td>243</td>
<td>$637</td>
</tr>
<tr>
<td>Los Angeles-Long Beach-Santa Ana, CA</td>
<td>168</td>
<td>$439</td>
</tr>
<tr>
<td>Boston, MA-NH-RI</td>
<td>154</td>
<td>$403</td>
</tr>
<tr>
<td>Philadelphia, PA-NJ-DE-MD</td>
<td>116</td>
<td>$303</td>
</tr>
<tr>
<td>Atlanta, GA</td>
<td>88</td>
<td>$230</td>
</tr>
<tr>
<td>San Diego, CA</td>
<td>44</td>
<td>$116</td>
</tr>
<tr>
<td>Baltimore, MD</td>
<td>36</td>
<td>$94</td>
</tr>
</tbody>
</table>

*Source: Baxandall et al. 2008*

A comprehensive sprawl index developed by coauthor Reid Ewing of the National Center for Smart Growth at the University of Maryland ranked 83 of the largest metropolitan areas in the United States by their degree of sprawl, measured in terms of population and employment density, mix of land uses, strength of activity centers, and connectedness of the street network (Ewing et al. 2002). Even accounting for income and other socioeconomic differences, residents drove about 25 percent less in the more compact regions (Figure 17). In sprawling Atlanta and Raleigh, residents racked up more than 30 miles driving each day for every person living in the region. In more compact Boston and Portland, Oregon, residents drove less than 24 miles per person per day.
To have an intelligent discussion about the benefits of public transit, a useful starting point is to discuss the potential savings at hand, which is especially pertinent in a recession when cost saving is the imperative.

“As a nation we spend more than any other country on transportation, but it’s carried by individuals, and it’s not perceivable. There are huge potential savings in forms of efficiency if we make different transportation and land-use choices as a society”

(Private conversation with Autler, 07/14/09).

A case study analysis is now pursued to glean lessons learned, which is an extremely useful tool when engaging stakeholders on topics of transit and land-use.

**B. Best Practices: Locations**

TOD is a fledgling practice and the science behind it is still racing to catch up. Since TOD is something of a nebulous concept, it runs the risk of failing to meet potentially unrealistic standards. Therefore, it is essential that TOD is properly defined and a system of metrics developed for performance assessment. The following sets of best practice locations were chosen to illustrate how similar challenges were overcome through different methods in different places (Chart 2).

Portland, Oregon and Arlington, Virginia were chosen because they are the most oft-cited success stories and it would be remiss to leave them out. Both hold important lessons regarding long-term vision and joining together land-use and transit policy. Finally, Charlotte, North Carolina, was chosen as a case study partly to highlight the political and regional diversity of successful TOD projects – Charlotte being in the South and in a more conservative part of the country. It was also chosen because it is a recently completed project and it is important to highlight its successful features while it matures.

The paper then turns to different types of best practices including place making (differentiating a node into a unique place in the community), pedestrian spaces, organizational best practices (successful methods of organizing and running a TOD) and bike lanes. These are all integral components to a TOD project, but can individually bring value to a given community.
Portland, Oregon

Our first case study brings us to the oft-cited city of Portland, Oregon. Portland has gained a reputation as a livable, healthy, and prosperous city, saving the equivalent of $2.6 billion annually in gasoline and time due to the measures implemented to reduce the need for residents to drive. Per capita VMT in Portland is 20 percent lower than the national average for other large metro areas, where the need to drive everywhere takes time away from family and friends and has a major impact on the household budget (Figure 18) (Oregon Regional Government).

In surveys by the National Association of Realtors, more than half of the respondents say they want to live in walkable places that have good public transportation access. For this reason, Portland has become a desirable place to live since it offers walkability and proximity to transit unlike most cities in the U.S.

Figure 18

Building upon the Portland Streetcar’s success, United Streetcar (a subsidiary of Oregon Iron Works, Inc.) began manufacturing the first U.S.-built modern streetcar in 2008. In addition to creating a new source of local jobs directly, the Portland Streetcar has helped stimulate $3.5 billion in new development in downtown Portland and revitalized old neighborhoods that were in decline (Baxandall et al. 2008). Within a three-block distance from the streetcar, real estate investment has surged, with density increasing over 40 percent in just a few years. Ridership itself has also exceeded expectations and been steadily increasing since its inception (Figure 19).
Charlotte, North Carolina

Charlotte has changed the transportation paradigm in the South with its recent light rail system: "The “LYNX.” Charlotte approved a sales tax increase of half-a-cent in 1988 to fund its LYNX light rail system. 57 percent voted for it and in 2008 70 percent of voters rejected repealing the sales tax. Public opinion went from “should we have a light rail system” to “where’s my line?”

Pat McCrory, Charlotte’s conservative Republican mayor, decided 14 years ago to get a light rail and got a lot of flak for it. However, he made the argument that it was part of the business plan for Charlotte. According to the Mayor, “A transit line is a great recruitment tool for bringing in new business.” He reasoned that ultimately, “We’re preparing for the future as opposed to reacting to the future” (Private conversation with Votaw, 07/10/09).

In Charlotte, transit officials say that more than $291 million in new development has been built near stations on a 10-mile rail line that opened last year. They say an additional $1.6 billion in development has been announced for the rail corridor (Private conversation with Votaw, 07/10/09).

Charlotte demonstrates the importance of accessibility and public support. Once the light rail was in place and the economic and other outcomes could be readily viewed, public support grew for the transit-oriented development surrounding the light-rail.

There is a general stigma of transit-takers “only” consisting of low-income residents and those without any choice (Molinaro 2009). By Charlotte building stops near Bank of America and the Time Warner Cable Arena, the stigma began to be dismantled.

Charlotte is now preparing for the next boom by tripling the length of its light rail system and believes that planning and transit are key to economic recovery.
Charlotte is of special interest because last year public ridership in America was the highest it has been in 52 years, and according to the American Public Transportation Association, “The light rail system that started in November 2007 in Charlotte, NC showed the highest percentage of increase with an annual 862 percent increase” (APTA 2009).

It is important to investigate the benefits of transit-oriented development irrespective of economic conditions. Therefore, research is needed to examine how Charlotte’s recently completed transit-oriented development fared during the current recession.

Arlington, Virginia

The Rosslyn-Ballston transit-oriented corridor is often called America’s best TOD. The corridor, containing 7.6 percent of the county’s land area, generates 33 percent of its property tax revenue. The jump in the value of the corridor’s real estate – now assessed at $9 billion – has helped Arlington obtain an AAA bond rating and set its property tax rate lower than that of any other major jurisdiction in northern Virginia.

Arlington is a well-studied location of transit-oriented development because of the diversity of implementation techniques along the relevant five stops on the Washington Metro Line: Rosslyn, Courthouse, Clarendon, Virginia Sq-GMU and Ballston-MU. For example, Rosslyn was initially very successful with increasing property values and economic growth (Jacobson and Forsyth, 2008). However, because office development eventually crowded out other less profitable land options, this lessened the mixed-use aspect essential to TOD, and in turn weakened the potential for achieving other goals of TOD including mixed-use districts, economic resilience and cultural vibrancy.

Arlington County’s Rosslyn-Ballston corridor has sprouted nearly 18,000 dwellings and almost 14 million square feet of offices, thanks largely to commuter rail (Langdon, 2003). Each of the five stops on the corridor have different land-use and transit characteristics, which translates into diversity for the line, which many believes is core to its success. As Figure 20 demonstrates, proximity to business and retail are vital as well as average block size, something CNT similarly has demonstrated.

**Figure 20**

<table>
<thead>
<tr>
<th>TOD</th>
<th>1 mile square per ha 400 m from station</th>
<th>Businesses per ha 800 m from station</th>
<th>Average block size (ha) for 800 m buffer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rosslyn (VA)</td>
<td>6.1</td>
<td>16.7</td>
<td>3.34</td>
</tr>
<tr>
<td>Clarendon (VA)</td>
<td>4.1</td>
<td>11.1</td>
<td>1.81</td>
</tr>
<tr>
<td>Ballston (VA)</td>
<td>4.5</td>
<td>9.6</td>
<td>2.21</td>
</tr>
</tbody>
</table>

*Source: Jacobson and Forsyth, 2008*
The Washington, D.C. Metro is the overarching board onto which these pieces fit. The transit system is well established. Arlington County coordinates land-use and transportation policy to an unprecedented degree in the U.S. Through this coordination, Arlington County pioneered the so-called “bulls-eye concept,” which entails centering development around transit stations along a corridor. The county was able to secure funding with “…more than $1 billion of the District of Columbia’s Federal Highway Interstate Substitution Funds – the largest such diversion of funding from highway to rail in the county – that were used to pay for the design and construction of much of the core Metrorail system, an investment that had regional benefit” (Dittmar and Ohland 2004).

Rosslyn’s station is on the Orange Line and is the first stop on the corridor. It has a mix of residential and business along with limited retail centered around the metro stop. Clarendon has more of a village feel, which is something planners intended by encouraging greater development around the station while keeping residential neighborhood separate from the stop. Ballston has significant vertical space with office and residential as well as significant retail areas.

The TOD is successful for various reasons but chief among them are: extensive bike rails, streets have sidewalks (90 percent by 2002), lower parking standards, the corridor has clearly defined boundaries (which was a conscious decision), public participation is and has been encouraged, the corridor has the lowest vacancy rates in the region (besides Washington, DC), and the TOD was able to increase ridership to an average weekly ridership at the five stations at 79,000 in 2002.

Lessons learned include: public transit can become a catalyst for redevelopment as it did later in Charlotte; mixed-use development around transit hubs is essential to maintain a healthy balance to create and maintain economically and culturally vibrant communities with high transit ridership; and public involvement is essential.

**Best Practices: Integral Components**

Though certain locations can best encapsulate relevant best practices of TOD, it can also be revealing to isolate integral components of a successful TOD so as to better understand what aspects need to be considered when planning a TOD. **Chart 3** isolates best practices of the important integral components of selected TOD projects.

**Chart 3. Best Practices: Integral Components**

<table>
<thead>
<tr>
<th>Integral Components</th>
<th>Key Features</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Place Making (Union Station in Denver and in Washington, DC)</strong></td>
<td>DC success in place making potential for train hub, Denver has not to same degree</td>
</tr>
<tr>
<td><strong>Pedestrian Spaces</strong></td>
<td>Must occupy unique space in community and have pre-existing foot traffic</td>
</tr>
<tr>
<td><strong>Organizations</strong></td>
<td>Long-term planning, joint development, cooperation with other agencies</td>
</tr>
<tr>
<td><strong>Bike Lanes</strong></td>
<td>Safety and aesthetics are key, as well as where you place bike lane on street</td>
</tr>
</tbody>
</table>
Union Station vs. Union Station: The Importance of Place vs. Node

The section begins by looking at two transit hubs to underscore the importance of place versus node. Union Station in Denver, Colorado, and Union Station in Washington, D.C., both serve similar functions – connecting long-distance trains with a multitude of other transportation options. However, as the following analysis reveals, one does a lot better job of capitalizing on mobility synergies and place-making potential. This is not to simply rebuke one over the other, but instead to attempt to glean useful best practices for planning practitioners.

Union Station in Washington D.C. is one of D.C.’s busiest and best known places with 32 million visitors each year and a recently completed Bikestation. The station has several restaurants, an adjacent museum and a wide array of shops.

As for Denver, 8.4 million square feet of new retail, office and government space have been built along its existing 35-mile rail network (Private conversation with Boone, 07/14/09). There have been 11,000 residential units built near the rail line. However, the Colorado Passenger Rail Association, challenging the current redevelopment plan, sued the Federal Transit Administration. The project faced criticism because it was too much of a real estate project without any real elements of TOD.

ColoRail for this reason opposes the Regional Transportation District’s plan to move the existing light rail lines a quarter-mile west of Union Station. ColoRail states that this will result in passengers being “farther away than necessary from the 16th Street Mall shuttle bays and local and regional bus bays at the station” (Proctor 2009). This long walk to the 16th St Mall is an example of TOD’s evil twin: transit-adjacent development. Transit-adjacent development entails a lack of whole-systems thinking and includes, for example, unfriendly zoning codes and parking ordinances (Belzer and Autler, 2002). As the figure below (Figure 21) reveals, it is a 0.6-mile walk between Denver Union Station and 16th St Mall, which anecdotally is not a pleasant walk with little to no retail at ground level (Private conversation with Boone, 07/14/09).

Figure 21
The status of Denver’s Union Station project is changing by the month, but the important lesson here is to understand that D.C.’s Union Station place making potential was realized and why Denver has been struggling, at least in its initial stages.

Pedestrian Spaces

As noted, TOD is essentially about human-centric communities and therefore it is paramount to analyze pedestrian spaces. Pedestrian spaces need to be functionally designed with key components in place. Pedestrian spaces or malls are often underappreciated and scorned until they are in place. However, if poorly executed, they can undermine the entire venture.

Pedestrian spaces bring several secondary benefits including health benefits through increased walking and physical activity. There is great potential for synergistic benefits between retail and mobility. By being able to safely, conveniently, and pleasantly walk in a certain place, property value is elevated along the increased walking traffic path, which in turn leads to increased access to retail and services for walkers. For existing retail this entails more customers, encourages community vitality, as well as boosts existing public transit usage.

Research shows a price premium on per-square-foot basis for walkable communities between 40 and 200 percent. “A walkable place is typically 50 to 500 acres in size. The “penumbra,” that area around it, can be even bigger. These places are still suburban but they are within walking distance of the walkable places. This “penumbra” is seeing premiums of 20 to 80 percent over the rest of the market” (Rubenstein 2008).

Two components stand out as necessary for success: having a unique place in the community and a pre-existing supply of pedestrians. In other words, for pedestrian spaces to work in synergy with transit and land-use the horse must be in front of the cart. Pedestrian malls do not necessarily create land value directly, but they can increase it through land-use synergies and by boosting foot traffic. The Pearl Street Mall in Boulder, Colorado and the Third Street Promenade in Santa Monica, California are both good examples of places that have unique characteristics in the neighborhood and a pre-existing supply of pedestrian traffic.

A problematic example of pedestrian spaces can be found in Durham, North Carolina. The area of interest is representative of the transition taking place in the greater Durham downtown area as well as some lingering development problems. Downtown Durham is in the process of transforming its old industrial districts into residential, recreational and commercial hubs that are attracting new attention and investment. One such district is the American Tobacco District (ATD), which is situated just south of Durham’s City Center.

Lack of pedestrian access is a major issue facing the ATD, which serves as Durham’s major entertainment district. The area includes points of interest such as a newly built transit hub, the Durham Performing Arts Center (DPAC), and the Durham Bulls Athletic Park. Connecting the ATD to the City Center would lead to a renewed interest and gathering point for the citizens and visitors to Durham. There are three items in particular that stand in the way of connecting the parts of the city: first, the presence of railroad
tracks is a deterrent for pedestrians to walk across. Second, there is a lack of pedestrian-friendly sidewalks. Finally, because there are no storefronts that face this potential pedestrian corridor, making it an unappealing and isolated walk.

Organizational Best Practices

Transit agencies must become landowners for TOD to be effectively implemented. This strategy often results in higher ridership but can also generate an additional revenue stream. Transit agencies’ role should be to promote long-term goals and facilitate cooperation between stakeholders in both the land-use and transit arenas, which includes developers and transit riders. Ultimately, transit agencies could achieve successful TOD projects if they saw themselves not merely as providers of transit services, but as landowners and supporters of vibrant neighborhoods (Dittmar and Ohland, 2004).

The Bay Area Regional Transit (BART) district in San Francisco, the Dallas Area Regional Transit and the Denver Regional Transportation District (RTD) are just three examples of transit agencies that worked with local governments to coordinate transit and land-use. Successful TOD examples from these agencies include RTD conducting land-use studies on their Southeast line to determine what would yield the best return on investment. Similarly, DART succeeded in Dallas by reaching out to developers with marketing materials for each station area, providing information on demographics, land ownership, the characteristics of surrounding communities, and a basic market analysis (Dittmar and Ohland, 2004).

Bike-lanes

Not all bike-lanes are created equal. Boulder, Colorado, is a good place to look for properly executed bike-lanes. Well-done bike-lanes lead to more usage, are safer, and are more aesthetically pleasing. Interestingly, New York City has good and bad examples in the same city, which is an equally important lesson of compartmentalization of planning practices. The principal lesson is to switch the order of bike-lanes from (starting from the street) car lane, bike lane, parking, sidewalk; to car lane, parking, bike lane, sidewalk. Figures 22 and 23 below speak louder than words and are worth analyzing in their own right.
C. Problematic Practices

Certain lessons have already been gleaned by looking at best practices, but of equal or more importance are those instances where TOD projects have run into difficulties for various reasons including faulty methodology, philosophical disconnects and even technical mismatches. This section looks at Los Angeles and Atlanta as places where TOD projects simply must succeed. Otherwise, TOD is no more than an academic exercise if it only takes hold in Boulder and Portland and not in some of the largest and fastest-growing cities in America. Los Angeles and Atlanta have until now a poor track record of promoting smart growth and TOD, but recent developments show that they are trying, but have for various reasons run into difficulties.
Los Angeles, California

Los Angeles has long known been known as the problem child of planning practice in America. It exceeds air quality standards on a regular basis and the EPA has almost accepted this as a fact of life. The lessons from Los Angeles are once more not meant to rebuke the city’s efforts, but to see where planning practices have gone wrong, and where good intentions have been poorly executed.

TOD in Los Angeles has so far been fundamentally flawed because it has focused almost exclusively on housing. Transit planning has been based on the notion that people live and work centrally in the city. This is an erroneous view of transit habits in Los Angeles, which implies that there are faulty assumptions underlying the region’s transit system.

The system is limited because it was built on two assumptions that have since proved untrue: that commuting trips generated most traffic, and that most people worked downtown. Nowadays, people nationwide are driving so much to take their children to school, run errands, and engage in other activities that these trips far outstrip commuting.

A Los Angeles Times study of TOD in 2007, “...showed that only a small fraction of residents shunned their cars during morning rush hour. Most people said that even though they lived close to transit stations, public transportation took too long, was inconvenient, and did not have stops near desired places (Bernstein and Vara-Orta, 2007). The attraction of shops and cafes that are often built into developments at transit stations can actually draw more cars to neighborhoods, putting an additional traffic burden on areas that had been promised relief.

The LA Times study looked at buildings in the Los Angeles area and found that transit-based development weaned relatively few residents from their cars. It also found that, over time, no more people in the buildings studied were taking transit 10 years after a project opened than when it was first built, especially when free parking was offered at work (Bernstein and Vara-Orta, 2007).

A massive study by the Transportation Research Board (Cervero et al. 2004) shows that people who live near transit tend to use it more than people who do not. But the number is still minuscule compared with the number of people who drive. Residents were more likely to use transit only if:

- it took less time than driving
• they could walk to their destinations from the transit stop when they arrived
• they had flexible work hours
• they had limited access to a car

At the Pacific Court and Bellamar apartments in Long Beach, California, researchers found that just 6.3 percent of residents said they used the Metro Blue Line to go to work in 2003. More than 78 percent of the residents of the transit-based projects said they never used the lines (Wesco Homes).

Almost all of the transit-oriented construction that has so far been approved in the L.A. area is for housing rather than job centers or the village-style shopping areas which planners had originally envisioned. Backers – who include planners, elected officials and builders – say such development is the best way to avoid a traffic meltdown as 6.3 million anticipated new residents crowd Los Angeles, Orange, Riverside, San Bernardino and Ventura counties over the next 30 years.

Barring significant changes, this could mean that tens of thousands of residents will be clustered near train stations they only occasionally use. For most shopping, schools and jobs, they will still get in their cars. As Los Angeles moves ahead it faces the challenge of not having an established city grid structure as East Coast cities have. Yet, though the city has the most issues to overcome, it may also have the most benefits to reap.

Lindbergh City Center, Atlanta, Georgia

When Atlanta’s Metropolitan Atlanta Rapid Transit Authority (MARTA) announced plans to create a TOD at the Lindbergh Metro Station, and that BellSouth, Atlanta’s second largest employer, was going to locate its offices near transit stations, change was in the air. The Lindbergh TOD was completed in 2005.

By locating near transit stops, BellSouth understood that the relocation costs and subsidization of transit passes could both be outweighed by benefits through reduced costs of providing parking or less employee time lost to traffic and long commutes (not to mention employee morale).

However, the result was a transit-adjacent development (TAD) with a BellSouth office park and an attached transit station (Halbur, 2007). The surrounding single-family neighborhoods ended up suing MARTA because BellSouth’s move would entail 13,000 parking spaces and concomitant increases in density and traffic. MARTA won the suit.

Though the community had been at the table for the project, this ruptured relations between the agency and the community and resulted in a lawsuit. The amount of parking was based on business-as-usual estimates of transit ridership for BellSouth employees, which is indicative of the cultural barriers that TOD faces. In fact, a MARTA spokesperson noted, “... it would have been impossible to secure financing for the project unless lenders were guaranteed that commuters could find ample parking” (Dittmar and Ohland, 2004).
To underscore the issues of having just one, large corporate tenant, MARTA faced a serious issue when the economic downturn in 2001 caused the office market to crumble and BellSouth began to cut jobs. To truly have economic resilience, integral to TOD, mixed-use development is essential; Lindbergh failed in this respect. The end result was that the Lindbergh TOD was, as one critic noted, “...[a] suburban development plopped on top of a rail station.”

Flaws of this TOD included:

• One corporate tenant
• Despite mixed-uses, segregation to corners of development
• Intimidation and claustrophobia by towering buildings, parking decks, heavily trafficked arterials
• Little or no emphasis given to providing affordable housing
• Isolation to other neighborhoods
• Designed to arrive and leave by car

Specific lessons to be learned from Lindbergh include:

• Urban fabric and infrastructure takes time to adapt
• Place making is key: development must be attractive and pedestrian-friendly
• Short walking distances to transit do not necessarily create a place where a child can be dropped off at daycare on the way to the transit stop, where everyday errands can take place on foot, or where a business client can be taken to lunch without driving. The types of uses located within TOD must be carefully matched with the function of the place and with the needs and desires of residents, workers, and visitors
• Due to the level of complexity involved with TOD, the competing players and competing interests may hamper the overall outcome
• The transit agency prioritized monetary returns, which led to suboptimal outcomes when Atlanta’s economy took a downturn
D. Key Take-Aways

Implementing TOD is more art than science, measured on a spectrum of effectiveness. Ultimately, cities are dynamic laboratories that constantly change and will continue to do so ad infinitum.

“Good TOD is not magic. Rather, it is like theater: it requires a good script, strong vision and leadership, and actors are committed to working together. When these elements are in place, the result is greater than the mere sum of the parts. TOD works best when it is an ensemble piece” (Dittmar and Ohland 2004).

A spectrum of effectiveness reveals many shortcomings of TOD design and implementation. A review of TOD across the nation demonstrates a failure to fulfill their potential (Belzer and Autler 2002). Instead, there is a proliferation of conventional suburban single use development patterns, with conventional parking requirements, so that the developments are actually transit-adjacent, not transit-oriented.

Failures of design and planning abound, with many projects being traditional suburban developments that are simply located near transit. Institutional issues include unfriendly zoning codes and parking ordinances. Difficulties in dealing with the institutional complexities are prevalent, with much confusion resulting from the conflicting roles of local jurisdictions and transit agencies.

However, there are certain steps than can be taken to enhance the potential for widespread implementation. Key components for successful execution include:

- Establish transit connection to anchor walkable “bulls-eyes”
- Put in special zoning districts around train stations that will allow for greater density and mixed use development
- Get entity to manage the TOD, generally a non-profit business improvement district
- Capture land-value for public transit; in WMATA case, windfall profits went to the people who invested in the infrastructure

Problems to watch out for include:

- East Coast cities have an urban grid that is closely connected to the local transit system, whereas in Southern California work and school sites are not necessarily near train and bus stops
- Transit-adjacent development has diluted TOD research because it is hard to filter out. TOD is often defined as development within a half-mile radius of a station, but that could include everything from a ravine to a high-rise. Rapid-response analysis of successes is key
- Sales taxes are not a sustainable way to fund transit because of the overwhelming and competing amount of money going to highways; federal funding needs to follow

TOD is a type of real estate development and the traditional standards and performance measures associated with are the same used for TOD. Therefore, the metrics by which
success is measured needs to be targeted as well and this can only be done with cooperation groups and agencies. This includes social goals and lifestyle aspects of TOD e.g., reduction auto trips, reduction in travel time, environmental impacts, health benefits from walkable communities, increased ridership, etc.

E. Barriers

A barriers analysis of widespread TOD implementation reveals legislative, cultural, logistical and financial barriers (Information from barriers analysis was gather from private conversations with Autler, Boone, Forsyth, Votaw and Wood).

Legislative barriers
- Zoning needs to be promoted where it is not (Houston) and effectively applied in conjunction with transit (Rosslyn-Ballston).
- Federal support currently aids public transit up to 50 percent, but only 80 percent for highways. This incentive structure undermines cost-driven development.
- Suburban homes often require no sound-proofing, no fire-proofing, and generally little regulation, as well as less complicated zoning and building codes. This contrasts starkly with city development which often involves complicated building permitting.
- Fragmented federal policy: according to a 2008 report by The Government Accountability Office: “...the Federal-aid Highway program functions as a cash transfer, general purpose grant program, not as a tool for pursuing a cohesive national transportation policy”

Cultural barriers
- Governments are more active outside of the U.S.; countries such as China, Sweden and France all set national transportation policy which is carried out through to the town level.
- TOD is inherently top-down, which does not mesh with American bottom-up approach and dislike for government.
- For most Americans, there are many perceived benefits of driving a car. Habitual convenience is huge and many auto-centric incentives will need to be removed to make the conveniences of a car low enough to switch to alternatives.
- Americans have very complicated lives with few locations clustered together e.g., schools, work, homes, shopping.
- Trial-oriented TOD is hard to do in America, because it takes a lot to ramp it up, but in Europe it has already been done.

Logistical barriers
- Lack of transit fill out
- Time-lag issues: there is a substantial disconnect in the timing that developers are accustomed to. Similarly, there is a tension between redevelopment potential versus the time delay to get public ridership: build somewhere with a pre-existing supply of riders, and redevelopment potential is low, build somewhere where it may take years, and redevelopment potential is greater.
- TOD requires many players to get out of their silos, which can be difficult to
sustain in practice.

- Zoning and permitting restrictions can make the approval process a maze. Lenders often do not understand the large and intricate projects. Local residents often lay down early opposition to density-rich developments.

Financial barriers

- Land costs are usually higher around transit stations, which makes it harder and more expensive for a transit agency to purchase said land.
- Massive infrastructure upgrades are needed to support increased density, something that the U.S. is woefully lacking and underfunding.
- The cost-structure of parking needs to be rethought with respect to public transit.
- Federal funding, as previously noted, does not just weigh toward highway spending but ends up undermining transit projects.

In summary, legislative barriers include funding issues mostly relating to federal funding, complicated zoning for urban and smart growth projects, and a lack of national policy. Logistically, there is not much pre-existing transit as there is in Europe. This is not necessarily an issue since transit can be used as a starting point for TOD and used as a redevelopment tool. There is also a significant time lag between the start of a TOD project and its realization of residential density and transit ridership, not to mention the inherent complexity of TOD projects. Culturally, TOD is seen as a subsidy whereas highways are seen as an investment. This is a significant cultural hurdle, as well as the perceived benefits of cars along with the “complicated lives” of Americans. Finally, financial barriers involve parking and long-term payoffs. Section II of this paper will go into this in more detail.

F. Main Players

The issues and topics identified until this point are recent but not brand new. Several organizations have been working on these specifics topics for a while, and other organizations have started to look into these issues from various angles including health, environment and job-creation potential.

The lack of a national, integrative vision for TOD hampers any progress individual players can achieve. Thus, it is important to look at the field of active players in this realm to see what has already been done, how, and by whom? Two types of analyses presented below tell more of the story.
Figure 24

The first analysis (Figure 24) is a temporal landscape analysis of the various stakeholders involved. Time is on the x-axis and potential for impact on widespread TOD implementation is on the y-axis. Yellow players are key players working on TOD implementation, having recognized TOD itself as a worthwhile goal. This includes, for example, Reconnecting America. Key peripheral players are those who are promoting issues relevant to TOD. This includes, for example, AARP, which is promoting walkability. The four quadrants of Figure 24 are divided by how long it will take for widespread implementation (near-term versus long-term) and by how much impact its activities can generate (low-impact versus high-impact).

In clockwise order, local initiatives are found to have high-impact by being visible and transformational. They change not just a given structure, but also behavior and planning paradigms. This includes Charlotte’s introduction of the light-rail, which is now seen as the new status quo and retail is lining up to locate along it.

Cultural “catalyzers” are those few actors who have gone after the culture of planning, in particular questioning the long-standing American paradigm of separation of land-use and transportation planning, including livable streets over cul-de-sacs. These players face cultural barriers, which as discussed in the previous section, may be the most onerous to overcome, which is why marketing and communication need to be effectively employed in this arena. Cultural “catalyzers” include Center for Neighborhood Technology (CNT) which promotes solutions to infrastructure issues through systematic approaches. CNT
has an innovative car-share program, pioneered Location Efficient Mortgages (LEMs), and has done an extensive graphical analysis correlating housing and transportation expenses across America. For example, in Norfolk, Virginia, CNT has demonstrated that higher access to transit correlates with lower transportation expenses, as a percentage of monthly income.

Non-governmental organizations (NGOs) appear to have less of a potential impact than cultural “catalyzers” in the same time frame. Because many NGOs are looking at tangential issues to TOD, it cannot be expected that they will have the same impact as those organizations specifically focusing on TOD. For example, this includes such NGOs as 1000 Friends of Oregon that does push for TOD among its various objectives, but is more fundamentally seeking to build a more livable built environment for its target group i.e., Oregonians.

Federal policy has been discussed in the previous section and legislation. The paper argued that there are certain key policymakers who are acting as cultural “catalyzers” within the federal government, but as a whole, the government is not setting overarching priorities for planning. The reason the federal government is not higher up on the impact axis is because of its low potential for progressive action in this field, which is limited due to cultural biases and non-partisan work. It does yet appear that smart growth has become a progressive or Democratic issue, but there are those who seek to couch it in those terms, as there are those who seek to make this a bi-partisan issue from the start.

Finally, and some would argue, most importantly, there are the for-profits e.g., developers. In the business world it is said that what gets measured gets done. If developers could be incentivized to support TOD by pursuing mid-term to long-term returns on investment, TOD may be able to launch onto the planning scene in a big way. This is culturally and politically attractive as are similar market-based mechanisms used to achieve social goals e.g., the cap-and-trade model for climate change legislation versus a carbon tax. The biggest issue here is that developers like straightforward projects with quick returns on profits. With TOD, it is often the case that neither is true. This is discussed more in Section II of this paper when looking at financial mechanisms.

The second part of this competitive landscape analysis looks at players filtered by overarching goals instead of actions (Figure 25). Three spheres are identified as goals through which TOD and its end-goal, vibrant communities, are being achieved: social and equity concerns, economic development, and environmental and health concerns. The outer light-blue ring represents key peripheral players and the inner, orange ring represents those directly focusing on TOD implementation.

The placement of relevant players is based on an extensive literature review of how widespread implementation of TOD is being affected by the various goals of the key players graphically represented below.

By mapping out the various players, it is clear that TOD is being pushed for its economic benefits, but only a few groups are highlighting the social and equity concerns, not to mention the environmental and health concerns. The reason for this may very well be
cultural in that society views issues of equity, environment and health as issues and concerns, instead of potential benefits. Key players must decide how to pursue TOD and its potential benefits, but as a whole, society stands to reap social, environmental, health and economic benefits from implementing TOD.

Figure 25

G. Projections

Projections of transit and demographic trends demonstrate two general findings: first, the deleterious costs of sprawl and its relevant indicators are only going to intensify; second, there is currently a significant opportunity to reap benefits from long-term, systematic action that will otherwise require future piecemeal action, which will be expensive, inefficient and time-consuming. The choices we make now are paramount because once built, structures

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and the built environment do not only have a long physical lifetime, but they become politically and culturally entrenched and cannot be tampered with.

Demand for TOD itself will likely grow as, through 2025, households without children will account for close to 90 percent of new housing demand, and single-person households will account for one third (Poticha 2006). These households without children and single-person households will often want to live in denser locations with more mobility and more access to services and jobs. The new mobile class will simply want more mobility (Figure 26).

A 2009 Growth and Transportation Survey conducted by Hart Research Associates asked two questions, which demonstrate a public shift in awareness about planning and infrastructure issues. The first question, shown in Figure 27, asked, “Which of the following proposals is the best long-term solution to reducing traffic in your area?”

As can be seen, “Improving public transportation,” is the highest priority stated. In second place comes a more structural preference, “Developing communities where people do not have to drive as much.” This is encouraging news as respondents demonstrate a desire for new communities with TOD components. Finally, 20 percent believe that building new roads should be the highest priority. Considering that the question asked referred to traffic, and building new roads is the status quo response, it is encouraging to see that only 20 percent thought this to be the best strategy for reducing traffic. To give some impetus to this question, the Transportation Research Board found that,

“If sprawl is uncontrolled, an estimated $927 billion of new roads will be needed to accommodate growth in the United States over the next twenty-five years. In a scenario where growth is controlled and concentrated in existing metropolitan areas this cost can be reduced by $110 billion” (Dittmar and Ohland 2004).

Similarly, the second question (Figure 28) asked was, “Given that the U.S. population will increase by one hundred million people by 2050, which of the following transportation approaches do you prefer to accommodate this growth?”

A full 75 percent of respondents believe that, considering projected population trends, rail systems should be built and improved. Only 20 percent opted for building new highways and freeways. Looking back at Portland’s experience, one can infer that availability of information and the format of options can play a huge part in swaying public opinion.
The underlying demand suggested above can be seen in recent trends in transit ridership. Car travel slowed in 2005 and even began to decline (Figure 29). This has been attributed not only to fluctuating gas prices, but also to a diminishing amount of new drivers and an increase in travel choices stemming from investments in the 1990s. Transit ridership itself has been on the increase. However, “... diminishing tax revenues are forcing many municipalities to make draconian service cuts and layoffs to close budget gaps in their transit systems” (EDF 2009).

Source: U.S. Census Bureau, American Community Survey
Americans are not just going shorter distances, but they are also changing travel behavior, which can be seen in mode choice. As seen in Figure 30, the percentage of American workers commuting via transit is increasing. This can partly be attributed to change in travel demand, but the supply side is also important to analyze. For example, there were no light rail systems in 1979, whereas in 2009 there were 34. Thus, many commuters in places such as Phoenix and Charlotte now have options previously unavailable to them.

However, as discussed in Section 2.6 Environment, not all pictures are as rosy. The U.S. Department of Energy’s Energy Information Administration (EIA) forecasts a 48 percent increase in driving between 2005 and 2030, which outpaces the projected 23 percent increase in population. As projections demonstrate, the United States cannot achieve adequate reductions in transportation-related CO$_2$ emissions without demand-side management and the subsequent reduction in VMT.

Figure 31 shows explosive growth in VMT with a recent plateau. Interestingly, the American Public Transportation Association recently reported that transit ridership went down 3.8 percent during the first nine months of 2009, heavily contrasting against 2008’s levels. However, this is likely due to the recession with concomitant unemployment and a lessened need and ability to travel. This is also due to decreased local and state funding for transit service, along with raised fares.

Together, the projections paint a picture of piecemeal progress towards addressing the need for public transit and smart growth, with attitudes shifting in that direction, and with BAU scenarios adding a dire if not ominous reminder of what the U.S. is heading towards if a shift in course is not taken sooner rather than later.
Figure 31. U.S. VMT, Annualized, December 1956-September 2008

IV. Recommendations

Several areas of TOD have been poorly explored, including barriers, marketing, and socio-cultural analysis. Increased research focus should be given to the following areas:

- There is a need to investigate why the economic benefits of TOD are not more widely understood and appreciated
- Few “next steps” have been suggested
- “Herd effect” may take place once more TOD are built, but it will be important to execute fast-response analytical effort on best practices to keep momentum going and to avoid negative association with TAD
- As economy recovers, there will be a newfound premium on mobility and residential demand for downsizing which TOD can address
- Sprawl is lambasted, TOD is promoted, but the “how” is sorely missing

As noted above, transit-oriented development requires mixed-use development as well as public transit. Communities that espouse transit-oriented development will be more economically resilient during recessions not only due to the mixed-use development and inherent economic diversity, but also due to their ability for people to get to new jobs, should they lose a job and not be able to afford a car. In other words, transit-oriented development may provide a certain degree of resilience against economic crises, which would otherwise push recently unemployed persons over the cliff towards poverty.

Belzer and Autler (2004) have detailed the economic benefits of transit-oriented development including “higher tax revenue from increased retail sales and property values” for local governments, “higher return on investment,” for the developer, and “shorter and more predictable commute times, easier employee access,” for employers.

Reducing vehicle miles traveled (VMT) by U.S. transportation is paramount. Light duty vehicles (LDVs) are used for the vast majority of personal travel (commuting, travel errands). In a majority of cases, the driver is the only occupant in the vehicle. Over the previous decades (with the exception of the last two years) average per capita vehicle miles traveled has risen rapidly in the U.S. Smart growth should not be forgotten in the quest to electrify the vehicle fleet, otherwise population growth will obviate progress in lowering CO₂ emissions.

Personal transportation is driven by where people live, work, shop, study, etc. Though one can try to directly influence behavior, it is not recommended and an alternative is instead one should provide the services people desire without requiring them to drive their cars as much – through public transit and mixed use development.

There are two types of levers to address rising vehicle miles traveled: first, reduce the need for miles traveled: locate residences closer to jobs, stores, restaurants, gyms, and schools. This includes promoting increased density and mixed-use zoning. Second, increase availability of alternative transit options: make public transit and carpooling programs readily accessible and convenient.
There is no simple solution to these challenges, and in fact, experts have been studying the subject for decades. Many good case studies exist, but the U.S. has not yet reached a tipping point. In the meantime, developers continue to build sprawl for a variety of entrenched, institutional reasons.

In general, four broad types of actions are required to discourage sprawl and drive change:

**Get rid of policy disincentives:** reduce unintentional and deliberate subsidies for sprawl, such as highway funding and minimum parking requirements.

**Raise public awareness:** drive demand through public education.

**Design more “vibrant” communities:** design mixed use developments, infill when possible, and orient around transit systems; conduct fast-response analytical effort on best practices to highlight benefits of communities that work.

**Improve transit systems:** improve mobility options, reduce operating costs, increase level of service, and get involved with land-use decisions

There are numerous implementation barriers, but here are potential partners a transit agency could engage with:

**Work with governments** – by working with state and local governments, planning agencies, and stakeholder groups, a transit agency can make the case that the costs of sprawl exceed its benefits and encourage policymakers to proactively promote better development.

**Work with developers** – convince private developers that mixed-use developments minimize risk and maximize sales prices because that is where the market is going.

**Work with NGOs and regional organizations** – the Center for Neighborhood Technology (http://www.cnt.org/) in Chicago does work across the U.S. including substantive GIS analysis of housing and transportation costs and would be an excellent partner for a transit agency. Similarly, as previously suggested, a regional organization can be very effective in rallying support for TOD as well as for implementation in the various stages. Chicago’s “2040” campaign is a great example of this (http://www.goto2040.org/).

**Bridge public/private gap** – function as a convener under the idea that stakeholder workshops and “charrettes” will help to maximize value for all parties and galvanize support for transit oriented development.

**Collaborate with campuses** – since large campus owners (especially universities) have real costs associated with high rates of single-occupancy vehicle commuting, they can
capture direct financial benefits from alternative transportation strategies and may be receptive to the message.

Section I of this paper has shown that, using concepts of sustainability and whole-systems thinking, transit-oriented development has social, environmental, health, and economic benefits. However, though the social benefits are fairly well known, and the environmental and health aspects are increasingly understood, there is still a disconnect between the economic benefits and social perception of transit-oriented development, which is a motivation for focusing on the economic resiliency of TOD communities. Further impetus is added when one considers that downtown centers are re-emerging as vibrant civic and cultural centers of the future.

Next steps in research should include:

- Look into how public transit agencies can fight twin trends of servicing sprawling suburbia and paying rising real incomes to their employees (they need operational funds, but stimulus funds are only for capital expenditures). An excellent resource is Gomez-Ibanez 1996.
- Parking is key. Look into Donald Schoup’s work, “The High Cost of Free Parking” (2005), who found that to provide parking for all 250 million cars in America, land equal to Connecticut would be needed. Also, look into Jia and Wachs (2000) who found that the average increase in price for a housing unit in San Francisco with parking was $39,000 to $46,000, which speaks for the need to unbundle parking from housing.
- Investigate how and why the ratio of road taxes to road expenditures is 0.6 in the United States, 1.3 in Switzerland, and 5.1 in the Netherlands. The beginning of an answer can be found in Pucher and Lefevre (1996).
- Look into education, communication, and media coverage and how this can be improved. There is already an identified bias called “Entitled Driving Journalist Syndrome,” which attributes a misunderstanding of TOD to media coverage because most journalists are drivers. Great coverage of the issue can be found here: http://greatergreaterwashington.org/post.cgi?id=2832
- Meta-analysis of transit ridership, home ownership and behavioral science is needed for understanding demand and cultural norms in America.
Section II

GRTC Transit System & TOD in Richmond
I. Executive Summary

As one of the fastest growing regions in the country, the Southeast faces unique challenges and opportunities to foster sustainable economic growth. Metropolitan areas such as the Greater Richmond, Virginia Region (Richmond) are seeing demographic shifts that point to a rising demand for livable urban communities which are all too often in short supply (Pollard 2007). One major solution that has been gaining traction as a means of curbing emissions, increasing mobility and fostering sustainable economic growth is transit-oriented development (TOD). As transit is an essential component of TOD, it is imperative that the Greater Richmond Transit Company (GRTC) be involved in any plans or projects in the Richmond region claiming TOD as a goal. The first half of this report has provided a robust background on TOD, and we will now get more practical in our approach, by making recommendations that can be implemented in the specific context of GRTC in Richmond. We begin with an analysis of the history and current trajectory of the Richmond region before launching into GRTC’s deliverable as requested by GRTC Planning Department in October 2009 and described below.

1. GRTC Company Vision For TOD

The first deliverable will tie all of the work in this report together by recommending key policy, financing and organizational TOD strategies for GRTC and Richmond going forward. This component sets a clear foundation to build a true vision for TOD in practice.

2. Midlothian Turnpike Corridor Analysis

Given the context of a broader corporate and regional vision for TOD, GRTC will want to apply these principles in practice, and the second deliverable will demonstrate that along a specific corridor. GRTC has been actively assessing opportunities for bus rapid transit (BRT) service along high traffic routes in Richmond such as the Broad Street corridor, and there is interest in understanding the opportunities that other corridors may present. The Midlothian Turnpike Corridor (Midlothian) is one of the highest performing corridors in GRTC’s system, and thus may be suited for BRT infrastructure upgrades to capture even greater ridership.

After outlining the existing conditions of the corridor, this report will assess the threats, opportunities, weaknesses and strengths of TOD and BRT on Midlothian using a TOWS Matrix. This tool has been utilized in various forms by other studies in Richmond such as the Jefferson Davis Highway Corridor and the Eastern Richmond TOD studies by VCU in May 2008 (Gulak & URSP Studio 2008). We also use this tool in our overall assessment of the Richmond region. Finally, we develop a recommended TOD-BRT Corridor Strategy for the Midlothian Turnpike going forward.
II. The Greater Richmond Region

A. Development, Land Use and Transit History of the Region

Figure 1: Map of Richmond Region and Metropolitan Planning Organization

![Map of Richmond Region and Metropolitan Planning Organization](source)


**Development and Land Use History**

Built strategically and named for the view at the falls of the James River, Richmond has always been tied to transportation in one form or another. It began as a port town using boats and barges as the primary vessels for trade with the rest of the world. Though this is still the case today with the Port of Richmond, the advent of rail, road and air transport have augmented and shaped the way that Richmond interacts with global economy today. The area today known as Church Hill was the original heart of the city, and much of the original street grid remains intact. From this efficient central grid, the region developed more haphazardly as outlying farmland was subdivided to produce cul-de-sac neighborhoods and shopping centers. Consumption of rural farmland in the region has risen at rates that now surpass...
the other two major metropolitan regions in Virginia as shown in the graphic to the right. Trip Pollard of the Southern Environmental Law Center has noted that “if current patterns continue, more land will be developed in the next 20 years in Virginia than in the previous 400” (Pollard 2007). Suburban sprawl has been a growing problem in the region since World War II, and if the counties are not incentivized to preserve land and channel growth to the heart of the Richmond region, the trend will continue.

Transit History

The beginning of modern transit history in Richmond was on May 4th, 1888 when Frank Julian Sprague’s electric streetcar system began operation as the first of its kind in the U.S. (Smith 2008). Several other prominent streetcar systems sprung up in cities like Boston, MA and San Francisco, CA after marveling at Richmond’s system. In the 1890s, large Richmond real estate owners had come to the conclusion that “transportation was the key to selling lots…and the streetcar line would add value to adjoining property” (McKenney 1986). Private developers actually were responsible for financing the streetcar lines as a means of getting citizens out to newly built “streetcar suburbs” such as Ginter Park and Westhampton Park which often included amusement parks complete with roller coasters and carousels. The fare was also kept artificially low at around five cents as a means of incentivizing “suburban” exploration. In reality, many of these suburbs were merely a few miles from the central business district (CBD) of Richmond, and today they are within the city’s boundaries. Streetcars flourished in the region from 1888 all the way until 1949 when the Hull Street-Highland Park line was dismantled and replaced by buses.

After the transition to buses occurred in 1949, service was controlled first by the Virginia Transit Company, which became the United Transit Company and was eventually bought out by American Transportation Enterprises Inc. in 1962. In 1972, the Greater Richmond Transit Company (GRTC) was created with federal, state and local funds as a non-profit public service corporation, which is now equally owned by the City of Richmond and Chesterfield County directly to the south (Yolton 2008). The two owners each have three board members and other nearby counties and municipalities are able to purchase service for their districts as well as make their case for partial ownership. To date, the other large player in the region, Henrico County to the east and west has not taken an active role in transit through partial ownership of GRTC. A recent mass transit study suggested the formation of a regional transportation entity capable of levying taxes to raise capital, but a bill to create this authority failed in the 2008 session of the Virginia General Assembly. GRTC currently gets all of its non-farebox funding from public sector sources at the federal, state and local level, but other options are available as will be demonstrated in the Vision for TOD section of this report (Yolton 2008).
B. TOWS Matrix of the Richmond Region

The TOWS matrix is a variation on a conventional SWOT analysis, which enables organizations and regions to understand the internal and external forces they face. TOWS goes one step further by developing appropriate strategies to attack each unique challenge at the intersections of the four categories. The four strategy types are:

**Domination Strategies:** Harnessing strengths to take advantage of opportunities

**Bring-It-On Strategies:** Harnessing strengths to fend off threats

**Mitigation Strategies:** Minimizing weaknesses to take advantage of opportunities

**Minimization Strategies:** Minimizing weaknesses to fend off threats

It is important to remember that strengths and weaknesses are internal forces that can be controlled by the subject of the analysis, and opportunities and threats are external forces beyond the control of the subject. In this first case, the subject is Richmond as a region, and we will begin the exercise by listing several observations in each category and then fleshing out the more detailed strategies. These strategies will also serve as a foundation for our TOD vision for GRTC in the next section. Many of the observations here will reference the work of James Crupi, a consultant who presented a broad and constructive vision for the region in his *Putting the Future Together* report for the Greater Richmond Chamber of Commerce (Crupi 2007).

**Threats**

- **Population Growth** - Richmond today faces a growing population with a shifting demographic profile. From 1990-2000, the metro Richmond region grew by 15.12% from 865,640 to 996,512 residents (Pollard 2007). The bulk of this growth occurred and continues to occur in Henrico and Chesterfield counties in communities that are completely auto-dependent. This threat is beyond Richmond’s immediate control but could become an opportunity if channeled properly.

- **Loss of Federal Funds** – The recent federal high-speed rail funding awards show that Richmond is not currently perceived as a priority region for new intercity rail infrastructure investment. The American Recovery and Reinvestment Act (ARRA) has increased funding for this mode of transport by historic proportions as shown in the chart below, but so far the Washington DC to Richmond corridor has only received $75 million for adding a third track on 10% of the rail corridor. By comparison the Raleigh to Charlotte corridor received $520 million to double track that entire route (DOT 2010).
Opportunities

- **Population Growth** – As Crupi points out, “the question is not that growth will come; the question is how well it can be managed in order to maintain the quality of life that brings people here in the first place” (Crupi 2007). In other words, if harnessed and channeled properly, imminent population growth will serve as a major economic and social boost to the region.

- **High Speed Rail Corridor through Richmond** – In the same vein as the opportunity above, Richmond will inevitably become a node along the future high-speed rail corridor that will one day run from Boston to Atlanta. Richmond is the logical next step for the corridor, and thus must be prepared with the policies to capture and channel the growth that is sure to come with a ninety minute or less train commute to downtown Washington D.C.

- **New Governor’s Transportation Creativity** – Recently elected Virginia Governor Bob McDonnell has a wide range of new ideas for transportation funding and appears to have priorities in the right place. Some of his ideas include the privatization of the VA Alcoholic Beverage Council and using a portion of the growth generated at VA ports, which would generate $500 million and $2 billion respectively over a decade to fund long overdue transportation projects around the state (McDonnell 2010). He supports high-speed rail in Richmond, which means that some of these funds could be directed to that purpose, which would benefit the entire region.
Weaknesses

- **Identity Crisis** – Unlike its peers in Charlotte, Atlanta and Nashville, Richmond has thus far failed to marshal its immense historical and natural resources behind a coherent self-identity which can be broadcast to the world. Until a complete stranger can pass through the region and know with one glance what Richmond is about, the region will be selling itself short.

- **Cooperative Failure Between City and Counties** – The commonwealth form of government of the state of Virginia legally separates cities from counties by its nature. Such a framework prevents the creation of a truly regional Richmond government, and it has fed the political and economic turf wars that have plagued leaders in the region for decades. There is also a perception among county representatives that “regionalism is a code word for what’s good for the city of Richmond,” meaning little cooperation can happen without genuine efforts from both the cities and the counties (Crupi 2007).

- **Socioeconomic Warfare** – Though the struggles of economic and racial differences have slowly improved over time in the region, there is still a palpable sense that the region’s population has not yet reconciled these differences. For example, there is little support for increased public transit in Richmond among car owners, as they perceive the service to only be benefitting minority populations in poor neighborhoods. While there may be some truth to this statement, it is wrong to assume that increased high quality public transit service would not benefit the entire region over time.

- **Overbuilt Commercial Infrastructure** - Another regional weakness that hits home in the discussion of many of Richmond’s suburban corridors like the Midlothian Turnpike is the reality that the region has overbuilt (and continues to overbuild) its commercial infrastructure. There are simply too many underused and vacant “dead” strip malls to justify new ones in the counties. The Partnership for Smarter Growth, a non-profit dedicated to educating and advocating for smart growth solutions in Richmond recently held its second annual River City Saunter, an event where city leaders were guided on a bus tour of these abandoned malls, parking lots and big box stores in the region. To see this decay is to understand what has gone wrong and what must be fixed regionally.

Strengths

- **Low Cost & High Quality of Living** – With the exception of certain corridors in Henrico and Chesterfield, Richmond has minimal traffic congestion compared to peer cities. A low cost of living and a diverse array of recreational opportunities make it a bargain for many. The question is whether the region will maintain these characteristics without a plan to channel future growth.

- **Diversified Economy** – Richmond has skillfully transitioned from a primarily banking and tobacco-based economy to a highly diversified economy complete with
extensive manufacturing, biotechnology, education and non-profit sectors. Because of this fact, Richmond does not experience the extreme highs and lows of nationwide business cycles, creating a more stable and inviting environment for investment and jobs. Many of these sectors are also inclined to “cluster” together, meaning a high jobs density. Such density supports the growth of public transit to serve these industries and should continue to be encouraged.

- **Authentic Neighborhoods** – Although this strength exists primarily within the city of Richmond proper, it must be noted as an attractive and enduring feature of the region. The Fan, Church Hill, Shockoe Bottom, Jackson Ward, and the Museum District are just a few of Richmond’s dense, walkable and unique neighborhoods which serve as invaluable assets and educational tools for promoting smart growth strategies.

- **Strong Universities** – The region is blessed to have several world-class institutions of higher education supporting the growth of its knowledge-based economy. The University of Richmond, a small liberal arts private school located right near the western border of the City limits is complete with a business school, law school, leadership school, school of continuing studies, and strong arts and sciences programs. Virginia Commonwealth University (VCU) is a large public university with large graduate programs such as Urban and Regional Planning and Engineering in addition to its undergraduate offerings. These schools in addition to others in the region can play a major role in attracting and retaining talent to build a more robust economy.

Now that we have addressed the defining aspects of the Richmond region, we will put the TOWS matrix to work and develop coherent strategies that will inform GRTC’s overall company vision for TOD.

**Domination Strategies**

_Richmond has a tremendous opportunity to capitalize on its natural resources such as the James River and a rich American history. It must continue to encourage and grow a diverse economy and put in place the proper incentives to induce new commercial growth in the heart of the region. Doing so will be made easier with the advent of high speed rail, as many of the technology, defense and consulting firms in Washington DC look for lower cost places to build new offices. It is paramount that leaders build coalitions to fund a high-speed rail connection to DC regardless of federal monies._
The new tax revenue from businesses attracted by a short commute and low cost of doing business should be used for revitalization efforts in riverside neighborhoods such as Manchester. One major strategic concept from the Crupi report is to build a new riverside baseball stadium between the Hull Street and 9th Street bridges in Manchester. Doing so would provide patrons with a riverfront skyline view of Richmond, a view now only seen by most from interstate 95. Such an approach could ignite a new building boom in the neighborhood and attract new tourism from around the state and beyond.

**Bring-It-On Strategies**

*Harnessing strengths to fend off threats*

As population growth also presents a major threat to an unprepared region, Richmond should make infrastructure investments now to prepare. This means building out a more extensive public transit system into the counties and within the city, and preparing specific corridors to accept a major influx of residential and commercial activity. Such an effort will require cooperation to make sure that investments benefit the region as a whole as opposed to one locality. The Eastern Richmond TOD plan studied four specific corridors for TOD along Route 60, Route 5, Route 360 and Laburnum Avenue (URSP 2008). If adequately upgraded with public transit and pedestrian infrastructure, these corridors along with others in the region can channel population growth and maximize the efficient use of scarce tax and investment dollars.

Given the scarcity of federal funds for developing transit projects, the region should harness its diverse political and business base to generate the funds locally to fund major initiatives. Transient federal funds are not a reliable source of financing for long term and comprehensive local initiatives, and Richmond would do well to prioritize local resource utilization.
Mitigation Strategies
*Minimizing weaknesses to take advantage of opportunities*

Richmond’s weaknesses threaten to jeopardize progress at every turn, and many opportunities for transformative growth may be lost if its leaders fail to mitigate these weaknesses. Making progress as a region means that the counties must be genuinely brought into the conversation about pooling resources and directing a strategic vision. Leaders cannot let political structures and history get in the way of the immense synergies derived from regional cooperation. For example, a regional population of 1.5 million can amass far greater financial and organizational resources than a city population of 190,000 (Crupi 2007). By pushing regional resource pooling, Richmond can also begin to address its socioeconomic challenges. If today the challenge is poor neighborhoods in the city and wealthier neighborhoods in the suburbs, tomorrow the counties may wake up to a reversal of roles. In 2008, for the first time in U.S. history, suburbs “had become home to the largest share of the nation’s poor” (Brookings 2010).

The overbuilt nature of Richmond’s commercial infrastructure is a major drain on the aesthetic and economic vitality of the region, however some creative ideas could mitigate these concerns. The region could re-purpose dead malls and big box stores as preferred locations for backup data centers for DC firms that are in search of a cheap location at least two hours from their main facilities. There is rising demand for such space among growing corporations of all stripes and the “economic impact of just two 50 acre data center parks would be $800 million not including the businesses that would form around the park” (Crupi 2007). The potential of a vision around this concept is vast.

Minimization Strategies
*Minimizing weaknesses to fend off threats*

Defining a clear regional brand and vision will take the input of many stakeholders, but it must be accomplished quickly to minimize the threat of being unprepared for a large influx of new residents. Newcomers arrive with ideas and energy that can only be fully tapped if they can plug in to a larger Richmond vision. If there is not an overarching thrust or common thread pushing the region forward as a whole, a creative class of newcomers will leave for lack of recognition and opportunity to experiment with their ideas and a less mobile immigrant class will feel trapped and disenchanted.

There are many sources and mechanisms to tackle to socioeconomic challenges that
regions like Richmond face. On the federal, state and local level there are grants, loans and tax incentives in various packages that exist to help pull poor neighborhoods out of poverty. For example, Richmond’s newly merged Department of Economic and Community Development has repurposed its CARE neighborhood funds as the *Neighborhoods in Bloom Revolving Loan Fund* for small businesses. Several specific neighborhoods such as the one on Hull Street in Figure 8 have been designated eligible for individual loans of up to $50,000. Assuring that these financing options are well advertised and fully taken advantage of in Richmond should be a basic minimization strategy.

**Figure 9: Richmond Region TOWS Matrix Summary Table**

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. High Speed Rail Corridor through Richmond</td>
<td>2. Loss of Federal Funds</td>
</tr>
<tr>
<td>3. New Governor’s Transportation Creativity</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Strengths</th>
<th>SO/Domination Strategies</th>
<th>ST/Bring-It-On Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Low Cost and High Quality of Living</td>
<td>• Capitalize on the James River and American history resources</td>
<td>• Cooperate regionally on infrastructure</td>
</tr>
<tr>
<td>2. Diversified Economy</td>
<td>• Attract firms from DC with HSR</td>
<td>• Designate and invest in regional TOD Corridors</td>
</tr>
<tr>
<td>3. Authentic Neighborhoods</td>
<td>• Bolster tourism and revitalization with strategic investments such as riverside baseball stadium</td>
<td>• Prioritize local resource utilization</td>
</tr>
<tr>
<td>4. Strong Universities</td>
<td></td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weaknesses</th>
<th>WO/Mitigation Strategies</th>
<th>WT/Minimization Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Identity Crisis</td>
<td>• Foster a genuine regional approach to planning and visioning</td>
<td>• Create a brand that newcomers can buy into</td>
</tr>
<tr>
<td>2. Cooperative Failure Between City and Counties</td>
<td>• Address socioeconomic challenges with regional resources</td>
<td>• Assure that all financing mechanisms to combat poverty and decay are in use</td>
</tr>
<tr>
<td>3. Socioeconomic Warfare</td>
<td>• Repurpose dead malls and big box stores as backup data centers</td>
<td></td>
</tr>
<tr>
<td>4. Overbuilt Suburban Commercial Infrastructure</td>
<td></td>
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</tbody>
</table>
III. Vision for TOD at GRTC Transit System

Building upon the historical background and current strategic context provided by the TOWS matrix of the Richmond region, we can now move to suggest appropriate TOD policy, organizational and financing strategies for GRTC. Together these strategies will form a coherent vision that will guide decision-making on future projects.

A. TOD Policy Strategy

Land Use Policies

Land use policies that support TOD are essential to success and there are many examples and options that GRTC could and should pursue with the City of Richmond, the counties of Chesterfield and Henrico, and the General Assembly if appropriate or necessary.

Form-Based Code & Complete Streets

One such land use policy is called form-based code (FBC). This new approach to zoning has been embraced in cities across the country as a new means of enhancing the public realm by focusing on the form of development as opposed to the function (Davis 2004). Traditional zoning laws neglect the public realm by focusing solely on the specific land use of a parcel, whereas FBC is concerned more with the role each building plays in forming and supporting the public realm as a safe and desirable place for people to live, work and play. FBC policy would help Richmond and GRTC to set the stage for the development of vibrant and livable communities along the major transportation arteries of the city such as Broad, Cary, Main, Midlothian and more. The vibrancy derives from a concept known as Complete Streets where biking and pedestrian infrastructure is given at least an equal footing on a corridor if not priority as seen in Figure 10.

Figure 10: Complete Streets Concept in Los Angeles
The City of Durham, North Carolina’s planning department as of February 1st enacted a new FBC for the entire downtown area. Such a step will have many positive implications for revitalizing downtown Durham, and a side benefit is that parking requirements for new construction are no longer in place.

**Stringent Downtown Parking Requirements**

Parking requirements often force downtown developers to waste precious real estate with surface parking lots or scarce investment dollars on underground or multi-level above-ground parking decks. A more stringent parking environment downtown induces choice riders to choose transit more often for commuting and shopping purposes. It is important to craft parking regulations so that tourists passing through have a place to park temporarily, but everyday commuters and shoppers are limited in their options to park all day. Richmond residents who know the transit options available to them would be able to easily switch modes as long as those options are sufficiently comparable in time, effort and price.

**Urban Infill Development**

Urban infill policies play a similar role to FBC in that they promote development patterns that foster the density necessary for TOD. GRTC should make sure that the region has a comprehensive strategy in place for densification of its major transportation corridors.

**Expand GRTC Land Management Power**

GRTC is eligible to play a major role in the initial stages of TOD projects because it is legally allowed to purchase and hold land. This is a hugely valuable capability for a transit agency that knows where it plans to enhance and build new service. Pushing to maintain and expand the power to manage land in the region should thus be a top TOD priority for GRTC. Being able to hold specific parcels near planned station locations can significantly reduce developer costs by crowding out speculators before the announcement of a new line is even made.

**Financing Policies**

**Tolling and Taxing to Finance Transit**

Raising the funds for new transit projects and TOD more generally is a complicated and difficult task, so it’s important for GRTC to make sure that all capital sources are at its disposal. The ability to set up toll roads and tax assessment districts to fund public transit must be approved in the General Assembly. Bills that would accomplish this in Richmond have failed in the past, but the argument for greater transit funding will only get stronger as congestion and gas prices increase.
Non-Profit & Foundation Incentives to Fund TOD

There are a great many private sector financing sources that if given an incentive could potentially provide huge sums of capital to fund TOD. Foundations, non-profit institutions and major investors need to be convinced to help pay for TOD projects much in the same way that they fund historic tax credit projects. GRTC should thus sit down with all of these potential funders and build a consensus around the type of tax-credits or other benefits that could push private sector investment for TOD into the mainstream in the Richmond region. One region appropriate name that could be used to unify all parties around this new mechanism could be the Richmond Investment Vehicle for Economic Revitalization (RIVER) mechanism. This name would be an enduring reminder of the ever-present James River, which serves as a vital natural resource for all in the region.

Regional Cooperation Policies

Inclusive Regional Decision-Making Bodies

One of the biggest roadblocks holding back a regional transit system in Richmond is the lack of coordination or decision-making body within which the city and surrounding counties can make choices together about their collective future. Right now the Richmond Regional Planning District Commission (RRPDC) appears to have minimal power over transportation initiatives, in spite of the fact that it would be best positioned to wield this power. If GRTC cannot find a way to bolster the strength of RRPDC, then it should propose creation of a new Regional Economic Development Council which would manage TOD projects in the region and work toward expanded transit service in the counties.

Urban Containment or Growth Boundary

The concept of setting an urban containment or growth boundary (UGB) is highly appropriate for the Richmond region, a place with a dense core but also with a great deal of farmland within striking distance of downtown that is in danger of being consumed by sprawl. Portland, Oregon created a UGB in 1979 and has seen a great deal of urban infill and densification as a result. This has in turn led to the rise of some of the nation’s first modern streetcar lines and now Portland is a poster child for new urbanism in the U.S. A UGB in the Richmond region would have to be done with the full support of all of the counties in the region as well as the City to be done right, as it would affect the growth patterns of the entire region. To allay any fears that such a policy might stifle growth in the counties to the benefit of the City, it is important to illustrate that a UGB will on the contrary act to channel growth to pre-existing hubs in the counties, reducing infrastructure costs and raising property values.
B. TOD Organizational Strategy

As the sole provider of consistent transit service in the Richmond region, GRTC can choose to act either as a facilitator or as a barrier to TOD projects. GRTC is charged with producing transit service as efficiently and effectively as possible, but it can be so much more if it chooses to actively take sides in TOD debates. TOD project developers looking to build around existing service routes may look to GRTC for support either through infrastructure upgrades and coordination, or simply through public support. Such upgrades may include amenities like bike racks, benches, shelters and signage.

For TOD projects planned around new routes such as GRTC’s Broad Street BRT study or the Midlothian BRT study to be discussed in the next section, GRTC can play a dynamic leadership role in helping to encourage a specific type of growth at nodes and along the route. GRTC must act as the main facilitator of broad coalitions of planners, developers, investors and regional leaders, as major new TOD projects require a great deal of coordination. Few players in a TOD project have a greater ability to bring stakeholders to the table than the transit agency.

A paper by Nigel Wilson of the Massachusetts Institute of Technology outlined five major overarching organizational structures for public transit, two of which are appropriate for GRTC (Wilson 1990). The first is a close approximation of GRTC’s current structure and the second indicates a direction that GRTC could move toward in order to more effectively foster TOD.

Model 1: Classical Regional Transit Authority (RTA)

This is the model that currently best describes GRTC, with all operations and policy-making controlled by GRTC management and employees. However, GRTC does not provide a truly regional service because it has few routes connecting the surrounding counties with the city of Richmond. In the classical RTA, transit modes are limited to a few traditional types and the agency plays little role beyond transit. This is certainly the case with GRTC, which is strictly rubber-tired services ranging from conventional bus to vanpool. The benefits of this model include a strong and coherent image or brand for the transit system and the efficiency gains inherent in having one effective provider. Some of the noted drawbacks of the classical RTA are that “the agency may lose sight of its raison d’etre” or purpose, and that the agency may not “devote enough resources to policy questions or long term strategic planning” (Wilson 1990). For GRTC these concerns are not so stark, rather there are signs of a transition to a newer more dynamic organizational strategy.

Model 2: Extended RTA

By venturing into the BRT planning arena with the Virginia Department of Rail and Public Transportation (DRPT) and consultant Parsons for the Broad Street project, GRTC is making a long-term strategic choice to help design, fund and implement a project that could significantly change the face of its operations and the nature of its service. Such a project will inherently require GRTC to at least understand the land use and zoning
connections of the new rapid transit line, and may even present the opportunity for GRTC to get involved in land use and development planning to foster TOD along Broad Street and Midlothian corridors. The extended RTA model encompasses this step into the real estate development space, as other transit agencies such as Seattle Metro have done in the past. Metro recognizes that “its mission includes fostering development types which can more readily be served by transit” (Wilson 1990).

Getting into land acquisition and developing TOD corridors as a transit agency is not without precedent among GRTC’s peers, but the majority of the experience is at rail transit agencies. A recent study showed that 46.9 % of rail transit agencies have a formal program for TOD and 42% have full time TOD staff, while only 8.6% of bus transit agencies have a formal program and 3.4% have full time TOD staff (Cervero 2004). This should not discourage GRTC from realigning organizational strategy to create a formal TOD program or vision, because BRT done right is a rail-like service providing a strong foundation for light-rail and streetcar services in the long run.

C. TOD Financing Strategy

Financing mechanisms for TOD will always vary depending upon the project, and it is likely that funds will come from a wide range of sources because TOD brings together traditionally public sector transit agencies with traditionally private sector real estate developers. The complicated nature of TOD demands fully engaged stakeholders and politically and economically acceptable financing mechanisms to make projects a reality. GRTC’s overall TOD financing strategy should take an honest look at the project risks inherent in depending upon the federal government for the bulk of funds, as is currently the plan with the Broad Street BRT using Small Starts. There is steep competition around the country for these limited funds and GRTC and Richmond should not bet entire projects on the receipt of federal dollars. Multiple financing scenarios should be drafted so that the project still gets built regardless of the outcome of a rigorous selection process. As will be demonstrated in the selected examples below, this flexible financing mentality can ensure that TODs in Richmond have diversified and stable sources of financial support.

After performing a comprehensive literature review of the TOD financing literature (full review in Appendix A), we have concluded that the best way to understand the wide spectrum of financing options is to group them into public sector, private sector and

![Figure 11: TOD Financing Spectrum](image_url)

<table>
<thead>
<tr>
<th>Public Sector</th>
<th>PPP</th>
<th>Private Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Tax Increment Financing</td>
<td>1. CEPACs</td>
<td>1. Private Debt and Equity</td>
</tr>
<tr>
<td>3. Gas Taxes</td>
<td></td>
<td>• Land Taxes</td>
</tr>
<tr>
<td>4. DOT Sources</td>
<td></td>
<td>• Property Taxes</td>
</tr>
<tr>
<td>5. HUD Sources</td>
<td></td>
<td>• Special Assessment Districts (SADs)</td>
</tr>
<tr>
<td>6. Historic Tax Credits</td>
<td></td>
<td>• Impact Fees</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Program-Related Investment (PRI)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Patient Capital</td>
</tr>
</tbody>
</table>
public-private partnerships (PPPs) based on where the financing is being sourced as shown in Figure 11. For the publicly owned GRTC, the best options are transit revitalization investment districts (TRIDs), split-rate property taxes, program-related investment (PRI), joint development, and historic tax credits. All of these mechanisms can provide a basis for GRTC to support new TOD financing strategies going forward.

Transit Revitalization Investment Districts (TRIDs)

Since tax-increment financing (TIF) was not designed solely for TOD, the state of Pennsylvania has devised and legislated a new mechanism, the TRID, which enables the creation of TIF districts specifically around transit stops for the purpose of encouraging and funding TOD. Local governments such as Philadelphia are now able to “designate a TRID in any geographic area within 1/8 to ½ a mile from a transit stop” (Voith 2007). This new mechanism will be tested in the next few years as the city gears up plans to revitalize underused land around its SEPTA stations. Such an approach could be a value capture mechanism for new BRT lines in Richmond, as new stations along Broad and Midlothian are sure to produce new property tax revenue from focused development.

Split-Rate Property Taxes

One innovative method of value capture is to split traditional property tax revenues into their component parts: land and structure. Structures on property near transit do not derive additional value from their location; rather it is the land that appreciates in value (Junge 2009). Thus the suggested approach is to split the property tax rate in two and raise the land tax while lowering the structure tax. Benefits of this approach include no net increase in taxes and an improved incentive structure for developers and property owners through the virtual elimination of speculative holding of vacant parcels “as the higher tax would cause owners to develop or sell to someone who would” (Junge 2009). GRTC should look to this model as a powerful revitalization tool that promotes dense infill development, because developers would be forced to build more on each parcel in order to break even.

Cities in Pennsylvania have been able to levy split-rate taxes since 1913, and Maryland and New York State have investigated the approach as well (Hartzok 1997). Coordination with land use regulations is important for land value taxes to reach their full potential in a city, because without the flexibility to build tall and dense buildings, developers will simply avoid the parcels with higher land tax. Land value taxes are indirectly related to TOD because they encourage the sort of real estate development that will support it, so specific transit projects should be proposed in conjunction with tax reform to make the connection clear.

TRIDs and split-rate property taxes would both require legislation. Virginia has often been averse to tax increases, so simply changing the balance by splitting the rates may be more palatable, and it would be a boon to TOD in the region.
Program-Related Investment (PRI)

A PRI is a foundation or institutional investment to support specific social or environmental objectives with the expectation of earning a return within an established time frame as opposed to a grant, which has no expectation of capital returns (Renz 1996). PRIs benefit foundations because loans can be re-used for other charitable purposes once they are paid back and they benefit recipients by granting access to below market interest rates on debt financing. PRI has been used to construct facilities, purchase land and refinance debt, all of which are important components of any TOD project. The wide range of private foundations and individual investors that could potentially provide a PRI for GRTC in Richmond are listed in Appendix B. PRI is often outside of the comfort zone of many foundations that have a stake in Richmond’s future, so it is important to have an experienced developer who has successfully implemented TOD before to assuage any perception of added risk. Many of these investors could help fund medium and long-term portions of major TOD developments in the region. The TOD financing strategies of the future will certainly begin to include more private investment, if not exclusively private, and GRTC should begin positioning itself to take advantage of this trend.

Joint Development (JD)

In 2004, the TCRP defined JD as being “distinguished from TOD mainly by being tied to a specific real-estate project, venture, or brokered deal and involving the direct participation of a public entity, often a transit agency, in revenue streams and sometimes ownership” (Cervero 2004). Therefore, JD happens when a transit agency decides to get into the real estate development business. The most common JDs occur in the air rights of transit agency property, such as above a metro stop, but others have occurred when functional and adjacent private property was developed. Other JD mechanisms include “ground-lease arrangements, station interface or connection-fee programs, and other initiatives that promote real-estate development at or near transit stations to the mutual benefit of public and private interests” (Cervero 2004).

One of the most oft-cited users of the JD approach to financing TOD is the Washington Metropolitan Area Transit Authority (WMATA) in DC. Since 1970, WMATA has entered into 38 JD projects that now bring in annual revenues of $6 million and have a total value of $2.5 billion (Cervero 2004). From the inception of the DC Metro system, WMATA understood that the land around its stations would be valuable to hold and develop, and as a result of its foray into the real estate business there are now several world-class examples of TOD in places like Bethesda, Maryland and Ballston, Virginia. The best revenue generators to date have come from air-rights leases and ground-lease agreements around these stations. As GRTC looks to build new BRT and eventually LRT lines in Richmond, making a concerted effort to implement joint development by getting into the real-estate business should be a top financing priority. As a non-profit entity, GRTC is legally allowed to purchase land and manage that real estate as part of its portfolio as stated in § 13.1-826 of the Virginia Code (Yolton 2008). This purchasing power could prove a valuable tool if land and development rights in and around Richmond’s main transit corridors begin to increase in value.
Local, State and Federal Historic Tax Credits (HTCs)

Last but certainly not least is local, state and federal HTCs. These are hugely important to the revitalization of large swathes of Richmond’s core, from Manchester to Main Street. Because Richmond has been blessed with so much history, both the Virginia state and federal governments provide HTCs so that developers can profitably revitalize neighborhoods. The state enables a 25% tax credit and the federal government allows for up to 20%, meaning that 45% of the cost of any project could be paid for if it qualifies under the regulations. Also, “the Code of Virginia §58.1-3220.01 enables any locality to adopt an ordinance, which would provide a tax credit equal to property tax liens against real estate on which a building at least 15 years old has been substantially rehabilitated, renovated, or replaced” (DHR 2008).

This opportunity begins to intersect with transit along corridors like Broad Street and Hull Street, which have miles of decayed mixed-use storefronts. GRTC stands to benefit immensely from revitalized neighborhoods along its busiest corridors, as this will bring more foot traffic and a more vibrant feel to Downtown Richmond. More foot traffic means more ridership, so in a sense GRTC is receiving a helpful indirect subsidy every time historic tax credits are being used to make its transit corridors more attractive.
IV. Bus Rapid Transit in the Midlothian Corridor

A. Project Introduction

With a coherent company-wide vision for TOD in place, it is now time to put it into practice. The following section will analyze the viability of a potential new bus rapid transit (BRT) line to replace or augment current revenue services along the Midlothian Turnpike Corridor and in the immediate region. After defining the study area and BRT, this section will assess the existing condition of the corridor, evaluate it with a TOWS matrix and finally recommend a TOD-BRT strategy for GRTC along Midlothian.

Study Area

The 6.4-mile study area in Figure 12 runs from Main Street Station along Hull Street then onto the Midlothian Turnpike at the Clopton Street intersection and out to the former Cloverleaf Mall. This area represents the majority of current Bus Route 63, which serves as a spine for several other bus routes such as 61, 62, 66, 71, 73 and 74 as shown in Figure 13. BRT on Bus Route 63 will serve as a central spine for these Southside bus routes much as GRTC intends to design the Broad Street BRT to simplify services in that corridor. All observational and existing data used in the following sections aims to accurately assess this study area’s attributes and potential as a TOD corridor with BRT.
Defining BRT

The Federal Transit Administration’s (FTA) definition of BRT is “a rapid mode of transportation that can combine the quality of rail transit and the flexibility of buses,” however this does not tell the whole story (Levinson 2003). BRT is widely touted by transit planners and agencies for its two main benefits: cost effectiveness and operational flexibility. BRT can provide the same service as rail transit at a lower cost when it includes such features as inviting context-sensitive stations, adequate running ways, off-vehicle fare collection and Intelligent Transportation Systems (ITS) that keep buses on time and passengers informed while they wait. All of these components are essential to attracting choice riders and to maintaining a solid ridership base and can be done for less per mile than rail transit. Flexibility is a province of bus transit and BRT is no exception, but most BRT requires frequent all day service (at least sixteen hours per day, peak headways of ten minutes or less and midday headways of fifteen minutes) in order to maintain the quality and consistency that choice riders expect.

The right-of-way (ROW) design for BRT will also determine the type of service provided and can be compared to various forms of rail service as shown in the table below. The commuter rail level of service is highlighted here because it is anticipated to be the most viable level of service type of BRT given the characteristics of Midlothian Turnpike Corridor described below. This design would be most viable along the wider commercial portion of the corridor by providing dedicated center lanes for BRT.
Figure 14: Rail-BRT Level of Service Comparison

<table>
<thead>
<tr>
<th>Rail Level of Service</th>
<th>Corresponding BRT ROW Arrangement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy Rail Raid Transit (Metros)</td>
<td>Exclusive or protected right-of-way</td>
</tr>
<tr>
<td>Light Rail Transit (LRT)</td>
<td>Combo exclusive right-of-way, median reservations, bus lanes and street running</td>
</tr>
<tr>
<td>Commuter Rail</td>
<td>Exclusive bus or HOV lanes on highways to and from transit centers with significant parking with frequent peak service to CBD</td>
</tr>
<tr>
<td>Streetcar or Tram System</td>
<td>City streets with little or no special priority or dedicated lanes</td>
</tr>
</tbody>
</table>

Source: Levinson 2003, TCRP Report 90

B. Existing Conditions on the Corridor

The following section will analyze data from various sources to paint a picture of the existing conditions on the Midlothian Turnpike corridor. The analysis will address the following categories:

- Population & Housing
- Land Use & Transportation
- Employment & Commercial
- Community & Public Services

Population & Housing

The Midlothian Turnpike begins as a residential corridor where it splits off from Hull Street and becomes a commercial corridor after crossing over Route 161 – Belt Boulevard. There are also residential neighborhoods in the lots behind those facing the right-of-way in the commercial portion of the corridor. Population of employed workers within a half-mile radius of GRTC bus route 63, which serves the corridor, has decreased marginally since 2002, with a nearly flat trend line as shown in the graphic below.

Figure 15: Bus Route 63 Housing Trend within Half-Mile Radius

Population in the City of Richmond at large fell by 2% from 2000 – 2006 and was projected to fall an additional 1% from 2006 – 2010 (Pollard 2007). These are average rates for the entire city, and it is difficult to know if these negative growth rates would turn positive if a BRT were to be implemented along the Midlothian corridor. However, a recent study by the Federal Transit Administration stated that public transportation options such as BRT can induce densification and concentrated growth (DOT - PubTransRole 2010). BRT could thus be the catalyst that changes the population growth paradigm of the corridor and by association the region. But the sheer numbers don’t tell the whole story. It is also important to understand the spatial distribution of residents along the corridor.

**Figure 16: Residences of Employed Workers**

**Half-Mile Radius of Bus Route 63**

The map here shows the distribution of the population of 10,070 fully employed residents in 2008 living within a half mile of Bus Route 63 as it runs from downtown Richmond to the former Cloverleaf Mall just past the Chippenham Parkway. This output was produced using the U.S. Census Bureau’s LED OnTheMap program and the maps for quarter-mile and one-mile radii can be found in Appendix C. It is clear that a large proportion of the residential density occurs along the northeastern section of the corridor before the Belt Boulevard crossing, with two large apartment complexes being located on either side of the corridor near George Wythe High School.
Figure 17: Corridor Population

The one-mile radius data shows that given suitable pedestrian and bicycle access and the higher quality BRT level of service, the corridor could represent a market of nearly 25,000 potential daily riders.

Land Use & Transportation

Using the City of Richmond’s Parcel Mapper we were able to get an understanding of the land uses along the corridor. The majority of the land uses in the commercial section are zoned B-3 for general business purposes. This zoning classification allows for anything from a full-fledged shopping center to a small commercial establishment with residential units above ground floor, although the latter development option has not been observed on the corridor. The majority of land uses in the residential section are zoned with an R-4 or R-5 classification, which denotes either single-family homes with small yards or public facilities such as churches or parks (DCD 2008).

The land use dichotomy between the two halves of Midlothian represents a planning challenge when thinking about new BRT station location selection and design. While more traditional BRT center median stations may be appropriate in the commercial segment, it may be necessary to design smaller stops in the residential segment. In its commercial section, the corridor is neither pedestrian nor bike-friendly as there are three auto traffic lanes going both ways and no bike lanes or sidewalks on either side. There is a sizeable grass median throughout that could represent an underutilized public space or dedicated lane if properly developed.

Population data can be compared with transportation and land use data such as current ridership levels to determine the potential for growth with the advent of BRT. Currently, GRTC has seen average daily ridership on Bus Route 63 fluctuate between 1200 and 1800 from the year 2006 to 2010 (Figure 18, GRTC Planning Department). Compared to the roughly 25,000 residents within a mile of the corridor, this ridership average shows that a much larger market is not yet being tapped into.
As mentioned before, there are several “feeder” bus routes that lead into the Midlothian Turnpike corridor. With a new BRT line as the centralized spine for the corridor, it may be possible to reduce service and perhaps even eliminate some of the current lines. For example, many riders on bus routes 61, 66, 71 and segments of the current 63 service are within a mile of the study corridor, but currently do not have safe means to walk or bike to the main line. Creating the infrastructure to enhance BRT accessibility is a must to reduce costs and simplify the larger system, which will make it more easily understood by current and new riders.
Employment & Commercial

The corridor is a clear exporter of jobs to the City of Richmond and to other locations in Chesterfield and Henrico counties. Figure 19 shows the “commute shed” of employed residents living along the Midlothian corridor within a quarter mile radius of the route. Half-mile and one-mile radius maps can be found in Appendix D. A commute shed enables us to see where the employment hotspots are by using darker shading to denote more jobs per square mile. The most common jobs held by residents on the corridor are in the Health Care-Social Assistance and Retail Trade industries as shown in Figure 20.

Figure 19: Commute Shed of Residents within a Quarter Mile of Corridor

Field observation of the corridor showed that the commercialized section of Midlothian has signage denoting Richmond’s “Midlothian Business Corridor.” This segment begins near the Belt Boulevard crossing at Agency Avenue and ends near the Chippenham Parkway crossing at Greshamwood Place. It is overseen by the Midlothian Corridor Business Association (MCBA), which keeps a list of paying members. The most recent list is from 2007 and is available in Appendix E. Any effort to promote BRT investment along this corridor will need to include the members of MCBA, as they have a vested interest in the outcome.

Community & Public Services

The majority of public and community services along the corridor are either places of worship or lodging. One specific worship location called the Richmond Outreach Center (ROC) claims on its website to draw up to 5000 people for services. This massive weekly flow should not be overlooked in when thinking about BRT and TOD on the corridor. Another notable organization is the ElderHomes Corporation, which is just of the corridor on Carnation Street. ElderHomes is a non-profit community development
corporation that focuses on improving the housing and living conditions of disabled, elderly and low-income individuals. Such an organization would be a great partner in the planning and implementation of BRT and TOD nodes.

There are also services that act as detractors on the corridor, such the gentleman’s club Paper Moon among others. These establishments may bring revenue to the corridor, but they take away much more in creating the perception of a run-down neighborhood that would be unattractive to outsiders or families.

**Figure 21: Community and Public Services along Midlothian Turnpike**

<table>
<thead>
<tr>
<th>Places of Worship</th>
<th>Lodging</th>
<th>Schools &amp; Misc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ First Independent Methodist Church</td>
<td>▪ Days Inn</td>
<td>▪ George Wythe High School</td>
</tr>
<tr>
<td>▪ Morning Star Baptist Church</td>
<td>▪ America’s Best Value Inn</td>
<td>▪ Miles Jerome Jones School</td>
</tr>
<tr>
<td>▪ Ephesus Seventh Day Adventist Church</td>
<td>▪ Comfort Suites Inn</td>
<td>▪ Connie’s Cleaners and Coin</td>
</tr>
<tr>
<td>▪ United Nations Church</td>
<td>▪ Rodeway Inn</td>
<td>▪ Paper Moon and Other Gentleman’s Clubs</td>
</tr>
<tr>
<td>▪ Victory Family Worship Center</td>
<td>▪ Travel Inn</td>
<td>(community detractor)</td>
</tr>
<tr>
<td>▪ The Richmond Outreach Center (ROC)</td>
<td>▪ Turnpike Motel</td>
<td>▪ Coleman’s Dental Studio</td>
</tr>
<tr>
<td>▪ Jehovah’s Witness Center</td>
<td>▪ Colony House</td>
<td>▪ ElderHomes Corporation</td>
</tr>
<tr>
<td></td>
<td>▪ Motor Lodge</td>
<td>▪ Family Thrift Center</td>
</tr>
<tr>
<td></td>
<td>▪ Camelot Inn</td>
<td>▪ Daily Pawn Shop</td>
</tr>
<tr>
<td></td>
<td>▪ Host Inn Motel</td>
<td>▪ Goodwill Center</td>
</tr>
<tr>
<td></td>
<td>▪ Econo Lodge</td>
<td>▪ NBC Channel 12 Station</td>
</tr>
<tr>
<td></td>
<td>Richmond West</td>
<td></td>
</tr>
</tbody>
</table>

*Note: Sites in red are along the residential portion of the corridor*
C. TOWS Matrix for TOD on the Midlothian Corridor

Given the current conditions of the Midlothian Corridor, we can now develop coherent strategies for generating successful TOD around a new BRT route. The table uses the TOWS model to summarize these strategies, which will be described below.

**Figure 22: Midlothian TOD-BRT TOWS Matrix Summary Table**

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
</table>
| 1) Cloverleaf Mall Redevelopment  
2) Parking Lots  
3) Large Right-of-Way | 1) Private and Public Funding Scarcity  
2) County More Business Friendly  
3) Low Congestion in Richmond |

<table>
<thead>
<tr>
<th>Strengths</th>
<th>ST/Bring-It-On Strategies</th>
</tr>
</thead>
</table>
| 1) Residential Base  
2) Corridor Business Association (MCBA)  
3) High Current Bus Ridership (Commuters) | - Emphasize population in search for financing  
- Sell BRT as a tool to make the whole GRTC system more efficient and effective |

<table>
<thead>
<tr>
<th>Weaknesses</th>
<th>WO/Mitigation Strategies</th>
</tr>
</thead>
</table>
| Lack of Pedestrian Amenities and Safety  
Unsightly or Family-Unfriendly Land Uses  
Lack of Destinations Besides Downtown | - Work with state and local agencies to add pedestrian and bicycle infrastructure  
- Encourage additional mixed-used livable development |

<table>
<thead>
<tr>
<th>Domination Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Harnessing strengths to take advantage of opportunities</strong></td>
</tr>
</tbody>
</table>

Thanks to its connection to the denser corridor of Hull Street and downtown Richmond, Bus Route 63 currently has a relatively high level of ridership, and the potential for carrying commuters is great. The commute shed of residents along the corridor is heavily biased toward downtown as shown in the figure 23 with data from LED OntheMap. BRT on Midlothian should thus make commuters a target market, because within just one mile of the corridor there are over 5,000 residents who commute to the city every day.
Building upon the target market of commuters, there is ample paved parking lot space along the corridor, and agreements could be made with MCBA members to allow for park-and-ride facilities. MCBA members would benefit from this by increasing the amount of people passing their businesses twice every day, and GRTC would benefit from this by attracting ridership from even further outside the BRT corridor. It should be noted that park-and-ride facilities would only work if parking downtown all day were made more difficult and expensive. However, given the rights environment, GRTC will begin to dominate the market for choice-riding commuters.

The large ROW in the commercial segment of the corridor should not be overlooked as an opportunity to create world-class BRT stations and infrastructure. Often when dedicated ROWs are considered for BRT or LRT there are space constraints that limit the development. On Midlothian, there is ample space to get creative and perhaps even create some islands of green space surrounding the stations. Street trees would make a major difference in the look and feel of the corridor, and BRT would signal a turning point in Midlothian’s history.

**Bring-It-On Strategies**

*Harnessing strengths to fend off threats*

The question here is whether GRTC and Richmond will let outside forces decide the fate of the region, or pre-empt them with the bring-it-on strategies that can produce
paradigm shift in the way Richmonders get around. Though the Midlothian corridor may not have many strengths at present, GRTC must attempt to build upon what exists in order to prevent threats from becoming barriers to BRT and service improvements. One of the few strengths of the corridor is its population. GRTC can use this strength as solid evidence for revenue generation potential when it goes to private and public sector financing sources for capital.

Low levels of roadway congestion in the present-day Richmond region threaten to stymie efforts to build new transit lines by eroding public support. People will say there is no reason to spend public dollars on BRT if they don’t see terrible traffic everyday. But if the region continues to grow at a rapid pace, congestion is sure to become a problem in Richmond just like everywhere else that has chosen an auto-dependent development model. Convincing a skeptical public of a Midlothian BRT will require political and marketing tact, and the best way to sell the idea is to claim the new service will make the whole system more efficient (much like is being said of the Broad Street BRT). Routes will feed the main line BRT infrastructure along Midlothian and Hull Street, and some routes could be eliminated. This strategy would save public dollars and pre-empt regional congestion threats.

Mitigation Strategies

Minimizing weaknesses to take advantage of opportunities

The large ROW along the commercial portion of the corridor presents a major opportunity to build significant pedestrian and bicycle infrastructure in preparation for a BRT service. Currently there are no sidewalks in the commercial portion and it is not a safe place to be without a car. GRTC has had input into this matter with city and state agencies in Virginia to coordinate improvements in pedestrian and bicycle infrastructure both east and west of Belt Boulevard, but the progress of this effort was unknown at the time of this report. Once built, this infrastructure should also extend into the communities behind the corridor, to enable safe access to the future BRT line for both current and choice riders.

The Cloverleaf Mall redevelopment project in Chesterfield County presents a major opportunity for the corridor to move in a new direction regarding its commercial offerings. Currently, there are unsightly and family unfriendly land uses such as strip clubs that hinder the attractiveness of the corridor. Under its new name Stonebridge, the Cloverleaf redevelopment will be an 80-acre mixed-use development with the largest Kroger Marketplace in the southeast as an acre store. More such redevelopment should be encouraged along the corridor, keeping the emphasis on mixed-use and pedestrian-oriented design that supports livability objectives.

Minimization Strategies

Minimizing weaknesses to fend off threats

A major weakness of the corridor is the lack of destinations worthy of tourist or even regional visitors. For decades many residents of Chesterfield County have lived virtually
separate lives from their counterparts in the City of Richmond, rarely travelling to visit each other’s attractions or commercial districts. Allowing this trend to continue would be a major mistake, as businesses may choose to avoid locating in the city entirely due to a more palatable set of development incentives laid out by the county. In order to minimize this threat, BRT stations should be situated at intersections that have the greatest potential to be vibrant TODs that pull in pedestrians. Doing so could begin to pave the way for greater regional connectivity by encouraging residents of the county to consider exploring a newly vibrant corridor in their backyard.

The weaknesses of the corridor threaten to jeopardize financing of any potential BRT or TOD project, because unlike Broad Street, Midlothian is not as densely developed, nor is there any precedent of any fixed-guideway transportation system in its past. A federal funding source such as Small Starts, which is being used for the Broad Street corridor, will not be suitable for the Midlothian corridor. It will be crucial to find significant private sector partners to lead the financing of TOD along a new BRT corridor. An application for Small Starts capital funds would be far more attractive if it included the plans from several private sector developers to build TOD in concert with the new BRT.

D. Recommended TOD-BRT Development Strategy

BRT works best when it has a dedicated ROW and a route with distances between stops of at least half a mile. GRTC should pursue this strategy in designing its Midlothian BRT. Placing the BRT in the center median of the commercial segment and the center lanes (if possible) of the residential segment enables the development of legitimate BRT stations that define the essence of the BRT experience. Based on the suggestions made for LRT on Midlothian in a recent rail feasibility study, the following corridor alignment and BRT stations or stops are recommended for the corridor (Parsons 2003) in Figure 24. The Parsons study had 13 stops between Main Street Station and the Cloverleaf/Beaufont Mall stops averaging out to less than half a mile between stops. The recommendations here call for just 10 stops, meaning that the 6.4-mile route will have stops every 2/3 of a mile. The locations will serve as the main areas of TOD development and redevelopment, and should help inform the private sector about priority parcels and opportunities.
Figure 24: Recommended TOD Intersections/BRT Stations

1) Main Street Station (0 mi)
2) Hull Street at 4th Street (1.0 mi)
3) Hull Street at 12th Street (1.4 mi)
4) Hull Street at Jefferson Davis Highway (1.7 mi)
5) Hull Street at Midlothian Turnpike/Clopton Street (2.3 mi)
6) Midlothian Turnpike at Roanoke Street (3.3 mi)
7) Midlothian Turnpike at Covington Road (4.3 mi)
8) Midlothian Turnpike at German School Road (5 mi)
9) Midlothian Turnpike at Old Warwick Road (5.5 mi)
10) Midlothian Turnpike at Cloverleaf/Beaufont Mall (6.4 mi)
Station locations were selected based on the amount of current ridership at stops near them and growth potential. Figure 25 shows that the Hull & 12 Street stop has high ridership currently in addition to mixed-use storefronts that could be revitalized, but locations such as Roanoke Street and German School Road do not. Roanoke Street station would be in the heart of the residential neighborhood at an intersection with two churches and in close proximity to the local high school, while German School Road station would sit at a busy intersection that currently has large parking lots and vacant-looking establishments. These both represent TOD growth potential. Below is a timeline for the project to be built. Such a project could begin to make TOD a more attractive investment both for Richmond and GRTC. It will also make the region an even more appealing place to live, a virtuous cycle that leads to economic prosperity and sustainability in the long run.

**Figure 26: Potential Timeline for BRT and TOD on Midlothian**

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<th>2012</th>
<th>2013</th>
<th>2015</th>
<th>2017</th>
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<td>Complete Draft Environmental Impact Statement and develop Locally Preferred Alternative</td>
<td>Begin Final Environmental Impact Statement and preliminary engineering</td>
<td>Develop coalitions of local officials, agencies and developers for TOD around stations</td>
<td>Final design and begin construction</td>
<td>Open Midlothian BRT and cut ribbons on first wave of TODs</td>
</tr>
</tbody>
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Appendices

Appendix A: The TOD Financing Spectrum

When financing TOD projects, it is crucial to understand the full spectrum of mechanisms available. Financing is perhaps the most important aspect for any municipality or transit agency looking to achieve sustainable economic growth. Because TOD brings together traditionally public sector transit agencies with traditionally private sector real estate developers it is common to see the funding for projects come from wide range of places. When reading through the material discussed below, it is important to remember that the complicated nature of TOD demands fully engaged stakeholders and politically and economically acceptable financing mechanisms to make projects a reality.

After reviewing the TOD financing literature, we have concluded that the best way to understand the wide spectrum of financing options is to group them into public sector, private sector and public-private partnerships based on where the financing is being sourced. For the publicly owned GRTC in Richmond, the best options are transit revitalization investment districts, split-rate property taxes, program-related investment, and joint development. The comprehensive literature review below will explain all of these mechanisms and more to provide a basis for GRTC to support new TOD policies and financing strategies going forward.

I. Public Sector

For the past half-century in the U.S., the lion’s share of transportation investment has come from the public sector. This has been a boon for proponents of an auto-oriented society, as the overwhelming majority of funding has gone to fund highway projects (Baxandall 2008). Much of this funding has come from gasoline fuel taxes that have been deposited directly into a Highway Trust Fund, which has been receiving inflows since 1956. The gasoline tax is currently at a very low (by international standards) 18.4 cents per gallon, where it has been since 1993. In order for TOD to truly work on a countrywide basis in the U.S. this favoritism afforded to automobility will have to be shifted, but in the meantime there are several public sector sources that can work for TOD projects on a case-by-case basis.

Tax-Increment Financing (TIFs) and Transit Revitalization Investment Districts (TRIDs)

TIFs have been used to fund transit infrastructure to support TOD in cities such as Charlotte, which built its light rail system with this approach and Chicago, which has 129 TIF districts covering thirty percent of the city’s land (Fogarty 2008). Though laws vary from state to state, TIFs are most often used to capture the increase in property taxes or retail sales taxes that occur within the area affected by new development. TIF works best when associated with new development as opposed to re-development of existing property, because it is capable of redirecting 100% of new tax revenue toward TOD investment without increasing tax rates at all. Therefore, the more vacant lots that can be developed within a TIF district, the more revenue can be collected to finance a new rail line, bus line or associated TOD-supporting infrastructure.
Traditional TIFs have faced some criticism because their revenues are not always used for TOD; rather they have been used extensively to support many of the types of development that TOD seeks to prevent. Since TIFs were not designed solely for TOD, the state of Pennsylvania has devised and legislated a new mechanism, the Transit Revitalization Investment District (TRID), which enables the creation of TIF districts specifically around transit stops for the purpose of encouraging and funding TOD. Local governments such as Philadelphia are now able to “designate a TRID in any geographic area within 1/8 to ½ a mile from a transit stop” (Voith 2007). This new mechanism will be tested in the next few years as the city gears up plans to revitalize underused land around its SEPTA stations.

**Debt Financing**

Federal, state and local bonds can be issued and underwritten by the government through various arrangements at below-market interest rates to finance TOD. The Transportation Infrastructure Finance and Innovation Act of 1998 (TIFIA) is just one example of the federal government providing credit assistance such as secured loans, loan guarantees and standby lines of credit for debt service (DOT 2009). This program aims to attract private investment capital by providing gap financing and guarantees in order to stabilize a project’s fundamentals for potential investors.

**U.S. Department of Transportation (DOT) Sources**

The US DOT has a wide variety of taxpayer-funded sources of funds that can be used to support transit projects and TOD more broadly. Transportation Investment Generating Economic Recovery (TIGER) grants under the American Recovery and Reinvestment Act provide up to $1.5 billion through September 30, 2011. The DOT Secretary can make TIGER grants on a competitive basis for capital investments in surface transportation infrastructure projects that will have a significant impact on the nation, a metropolitan area, or a region. Proposed projects should be between $20 million and $300 million and up to 100% of a project could be funded by a TIGER grant, though preference is given to projects that merely need DOT funds to fill a financing gap in a larger funding package.

Another DOT source is Congestion Mitigation & Air Quality (CMAQ) funds, which were most recently authorized through the SAFETEA-LU bill to provide over $8.6 billion dollars to State DOTs, MPOs, and transit agencies to invest in projects that reduce criteria air pollutants regulated from transportation-related sources over a period from 2005 to 2009. CMAQ funds have been utilized by MPOs, such as Richmond’s Regional Planning District Commission for investments in intelligent transportation systems, ride-sharing and education and outreach programs, but these are not the only uses allowed by DOT (Martinez 2003). Transit service or system expansion is eligible for CMAQ funding, and St. Louis took advantage of this opportunity to fund their 18-mile Metrolink Program. To support the effort to finance TOD, MPOs and transit agencies may want to redirect their CMAQ funds toward the capital costs of new transit service in their region.
The final DOT source discussed here is the New Starts program and its complementary Small Starts program. SAFETEA-LU authorized $6.6 billion in total funding for fiscal years 2006, 2007, 2008, and 2009 for New Starts. Under this program, the federal government will pay up to 80% of the cost of a project, but highly encourages state and local funding sources in its selection process (Rodriguez 2009). For Small Starts, grants are for capital costs associated with new fixed guideway systems, extensions, and bus corridor improvements. Requests must be for under $75 million in New Starts funds and total project costs must be under $250 million.

*U.S. Department of Housing and Urban Development (HUD) Sources*

Like DOT, HUD has quite a few programs that support TOD-supportive real estate projects that include community development and affordable housing, which becomes an increasing concern as property values rise after TOD is built. Community Development Block Grants (CDBG) provide communities with resources to address a wide range of unique community development needs that can include pedestrian access to transit and fostering mixed-income neighborhoods. Since 1974, the CDBG program has been one of the longest continuously run programs at HUD. The CDBG program provides annual grants on a formula basis to 1209 general units of local government and States. Total disbursements for 2008 were $4,354,161,601.07.

The Low Income Housing Tax Credit (LIHTC) program is also available to municipalities to finance the development of affordable rental housing for low-income households. Affordable housing is a crucial component of TOD projects that would otherwise displace low-income residents who are the most dependent on transit and walkability. Gentrification is often overlooked as a “good problem to have” in city centers that have decayed, but fostering and maintaining a mixed-income community with resources such as the LIHTC will only make a city more resilient and adaptive to economic shifts and it will ensure more ridership on the transit lines (HUD 2009).

**II. Private Sector**

Public sector funding is dependent upon ever-changing political priorities and scarce federal resources are often spread too thinly across the country so as to make only marginal improvements where a full-fledged TOD effort is what could truly catalyze economic growth. For these reasons, incorporating private sector TOD financing will be the key to unlocking the true growth potential of TOD in the future, and there are a variety of traditional and innovative financing mechanisms that can help lead the way.

*Private Debt and Equity*

Respondents to the TCRP survey indicated that the biggest factor influencing the amount of private debt and equity investment in TOD was overall capital market fluctuations (Cervero 2004). In other words Wall Street is currently neutral when it comes to investment in TOD projects because there is not yet recognition that synchronizing real estate development with transit projects could generate more value than the average project. When the capital markets are doing well, as they were before the 2008 collapse,
private debt and equity are used most often for real estate development around transit, rather than the transit line itself. One major downside of these sources is that the cost of capital is often quite high because investors from pension funds and Real Estate Investment Trusts (REITs) are often looking for quick and sizable returns on investment. As will be discussed later with PRI and patient capital, there are cheaper private financing options available.

**Value Capture: Three Methods**

As a broad concept, value capture is perhaps the most important approach to consider when crafting a financing package to fund TOD. It relies on the assumption that once a TOD project is completed, there will be significant increases in property values in the area and thus an opportunity to capture this value ahead of time or soon after completion for the purpose of funding the transit line or supporting infrastructure. Though value capture often has to do with property taxes, it has been categorized as a “private sector” financing strategy because of the direct impact that it has on private real estate developers and the fact that the funding is coming directly from private entities. Three methods of value capture are discussed below.

**Capture Method #1: Land Value Tax: Splitting Land and Structure Property Taxes**

*Note: Shown in body of paper on page 73.*

**Capture Method #2: Special Assessment Districts (SADs)**

SADs are areas in which a special tax or payment is agreed upon between property owners and the city and then applied to parcels that will benefit from a transit improvement (Brookings 2009). In essence, the land value increase associated with the TOD project is captured in advance of the project itself through direct payment. The obvious upside of this method is that it reduces the amount of necessary debt financing needed for a project. The funds raised through this approach are most often used to finance TOD during the construction phase, usually with a definitive ending date. SADs are meant to be structured for specific local as opposed to region-wide projects.

**Capture Method #3: Development Impact Fees (DIFs)**

DIFs are collected at a single point in time usually before a TOD project is implemented as a means of recouping infrastructure costs from developers on a dollar/square foot basis (Fogarty 2008). The main premise behind DIFs is that new development should pay the full cost of the necessary infrastructure to accommodate it. One major issue with DIFs is that they could have the undesirable effect of making transit-accessible areas unattractive to developers due to increased costs. However, they have worked in San Francisco, and notably for the purpose of covering transit operating costs as opposed to capital costs as is traditionally the case with public sector funding sources (Fogarty 2008).
**Patient Capital**

One final private sector approach is the use of patient capital or patient equity. Patient equity is often layered on top of a conventional TOD development budget in order to see it through the medium to long-term stages where conventional investors may begin to pull out. Most real estate equity funds often have a seven to ten year sunset provision for their investments in response to the nature of the real estate market, which is heavily dependent on DCF and IRR numbers as opposed to a more long term NPV calculation. For example, conventional equity may expect an IRR of 20-30% and then get paid all net-of-debt service returns on a project for the first five to seven years. If the TOD project takes fifteen years to complete, there may be greater total value generated, but there is also a need for patient equity to step in to fill the gap. Patient equity can provide financial guarantees of the construction loan and then take over financial returns after retiring the 1st tranche to conventional equity. Sources and providers of patient equity can include land or building owners, developers, pension funds, insurance companies, other institutional investors, REITs such as AvalonBay, individual investors, and non-profits (Leinberger 2007).

**III. Public Private Partnerships (PPPs)**

*Certificates for Potential Additional Construction (CEPACs)*

Originally developed as part of the Statute of the City in Brazil in 2002, CEPACs are tradable certificates of building rights that are sold by municipalities to developers and then traded in a market (Rolnik 2002). The municipality in which there is a proposed project issues a limited number of CEPACs, and developers pay directly into local government coffers for the right to build. Municipalities in Brazil are then required to use these funds for public investment in their region, which in many cases has meant development of Bus Rapid Transit (BRT) lines to support TOD (Lindau 2007). CEPACs can also be traded on the Sao Paulo stock exchange, making them relatively liquid assets that could theoretically be used to fund TOD projects throughout the country depending on which municipality receives the funds in the end. By one estimation, CEPACs may soon be able to capture up to fifty percent of the value of an infrastructure investment (Sandroni 2007). CEPACs thusly hold a great deal of promise as a pre-construction value-capture mechanism to finance TOD.
CEPACs are being encouraged in Brazil in the context of PPPs as a means of leveraging the private sector’s resources for major public projects such as BRT. In Brazil, much of public finance operates under the assumption that the best proposal is the one that includes the smallest percentage of public investment, while still achieving certain core project requirements. This is the case because many municipalities are incapable of debt financing following decades of mistrust by investors. Rules crafted in 2004 regarding PPPs enable municipalities to make a “sponsored concession” of revenues such as transit fares to private developers in exchange for capital investments (Lindau 2007). Brazilian PPPs must also have a minimum size of $10 million and a project life between five and thirty-five years long. It is clear that PPPs have become popular in Brazil out of necessity in financing projects, but that does not mean this model would not work well in the Virginia.

Appendix B: Foundations in Greater Richmond Region for PRI

- Jackson Foundation (www.jacksonf.org),
- Robins Foundation (http://www.robinsfdn.org/index.html),
- Dominion Foundation (http://www.dom.com/about/community/charitable-giving-and-the-dominion-foundation.jsp)
- Richmond Jewish Foundation (http://www.rjfoundation.net/index.html)
- Greater Richmond Chamber Foundation (http://www.grcc.com/View/Page/programs_foundation)
- Ukrops Foundation (http://www.ukrops.com/pdfs/foundation_guidelines.pdf)
- VCU Real Estate Foundation (http://www.vcurealestate.org/realestatefound/mission.html)

Many more available to support historic preservation here: http://bit.ly/aTu3ab
Appendix C: Quarter-Mile and One-Mile Residences

Residences of Full-Time Employed Workers
One-Mile Radius from Bus Route 63


Residences of Full-Time Employed Workers
Quarter-Mile Radius from Bus Route 63

Appendix D: Half-Mile and One-Mile Commute Sheds

Commute Shed for Half-Mile Radius from Bus Route 63


Commute Shed for One-Mile Radius from Bus Route 63

# Appendix E: Midlothian Corridor Business Association
## (2007 Membership)

http://www.midlothiancba.org/index.html  
http://www.midlothiancba.org/member%20directory.htm

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V. References (Section I)


Adapted from a speech by Bartholomew, Keith, Staff Attorney/LUTRAQ Project Director. *Making the Land Use, Transportation, Air Quality Connection (LUTRAQ) – Freeways or Communities: It’s Your Choice.* 1000 Friends of Oregon.


http://www.drcog.org/documents/MV%20plan%20brochure%202%2011x17.pdf


**Additional Literature Reviewed**


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References (Section II)


Wilson, Nigel H.M. *Organizational Options for Public Transport in the US.* Transportation Planning and Technology. Department of Civil Engineering, Massachusetts Institute of Technology, Cambridge, MA, June 8, 1990.
Additional Literature Reviewed


