APPENDIX G

NCHRP Project 19-13 Report

Contents

Chapter G1. Land Value Return and Recycling as an Approach to Funding Transportation

Introduction

This report describes the research information that informed the production of the Guidebook. The research conducted under NCHRP Project 19-13, Guidance for Use of Value Capture to Fund Transportation, and the Project Panel's direction resulted in focusing on activities that produced a Guidebook and Presentation on land value return and recycling instead of an assessment tool. The direction of the Panel was to focus the Project's efforts on developing a Guidebook and presentation that engages and motivates public officials to understand, consider, and implement land value return. This involved developing a clear definition of land value return and distinguishing that definition from existing industry information on value capture.

This report begins by distinguishing between value capture and land value return and recycling methods. Land value return and recycling (LVRR) methods are a subset of value capture methods. LVRR is defined as the public recovery of a portion of the increased land value that is created by public investment that results in performance gains in the transportation system or other infrastructure. "Recycling" denotes that the public sector reinvests the portion of land value return into infrastructure such as transportation. Land value return methods are fundamentally a means to generate funding to pay for infrastructure.

Value capture methods including LVRR methods have been used infrequently in the United States. When such methods have been used, however, they have been more common in the context of transit than highways. These methods are among the several policy options suggested by the National Governors Association (NGA) (NGA, 2008). The NGA report goes on to note that states play a key role in funding, operating, and maintaining our nation's transportation assets. It emphasizes, "w*ith demand for transportation growing, and with states facing competing budget priorities, there is an increasing need for new funding and financing solutions. The solutions that states are identifying and implementing represent an important element in enhancing and improving the nation's transportation system.*" It is within this larger funding context that value capture and LVR methods have come to play an important role. The Innovative DOT report series (Focus Area 1: Revenue Sources, Smart Growth America) also notes that funding transportation out of general revenue is becoming difficult, both because it is subject to changing budget priorities and because it underprices transportation, creating excess demand. The report's main recommendations to state DOTs are to explore new sources of dedicated revenue, preferably tied to direct beneficiary user fees. Land value return and recycling methods discussed in the guidebook are among the key approaches recommended. Other recent studies also come to the same conclusion (see for example, Levinson and Istrate, 2011; Page et al. 2017).

Evidence from the United States and elsewhere, demonstrate that well designed transportation investments have the ability to generate positive economic impacts. Some of these projects will have the potential to create land value benefits, which may be captured through land value return mechanisms. In other cases, the general economic benefits made possible by transportation investments may be captured by broad-based taxes. It is important to note that transportation projects in isolation will in general not be enough to deliver any of these benefits. They should be accompanied by other supporting strategies and linked to broader policy goals.

States currently fund their transportation projects relying on a mix of funding sources. A small portion of these funds is already in the form on indirect beneficiary funding which could include land value return-like sources. This is shown in Figure G1 as "Payments from Local Governments" which is approximately 2 percent of the overall funding mix. Figure G2Figure G2 shows the different types of local government

revenue sources, indicating that approximately 14 percent are collected from value capture and land value return-like mechanisms (not including other local options).

Value Capture and Land Value Return Funding

The most traditional form of land value return and recycling refers to land value taxes or fees. The American Association of State Highway Transportation Officials (AASHTO) BATIC Center for Excellence in Project Finance tracks several mechanisms under the broader category of value capture methods. Interesting hybrids or combinations of these mechanisms have also emerged (like the use of impact fees combined with special benefit areas served by transport corridors) as funding strategies. In general, the revenues generated by this approach are typically used to fund and finance capital costs of infrastructure. The hallmark of this approach is being able to create, identify and then recapture land values enhanced by transportation projects. This is in stark contrast to other revenue measures that support system operations, maintenance, and rehabilitation by compensating the public sector for user-imposed costs. In the United States, examples include utilization fees based on distance traveled, vehicle weight, roadway congestion, or land use intensity (e.g., transportation utility fees). Both types of methods can be considered jointly as funding solutions.

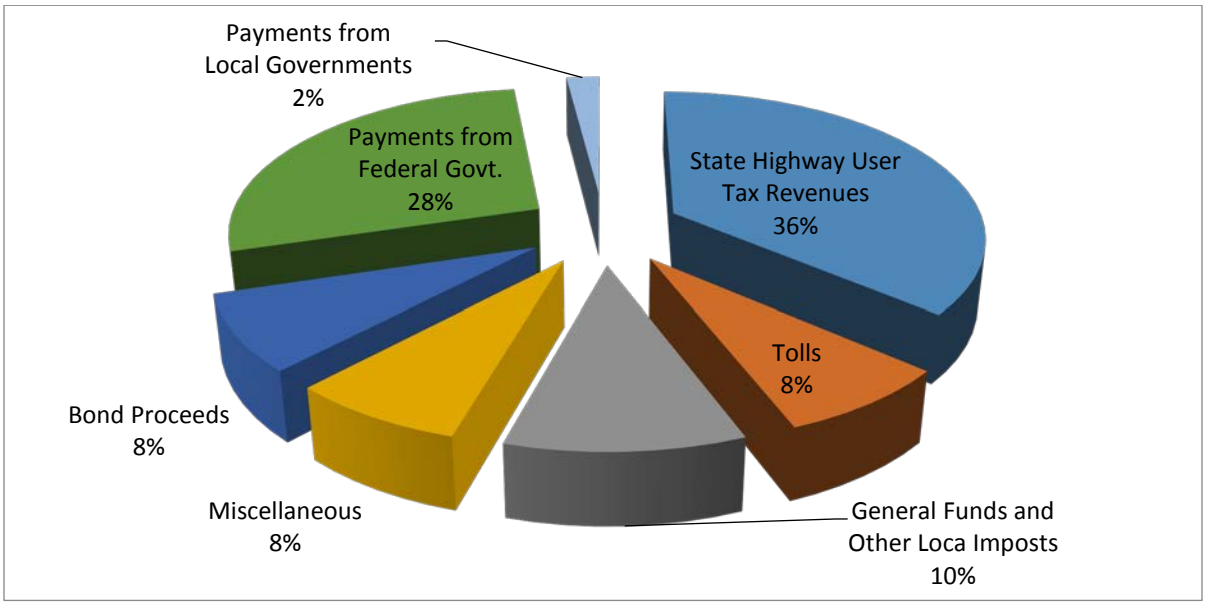

Figure G1. State Funding for Highways (Summary 2012)
(Source: Federal Highway Administration (FHWA), 2012: Table SF-21. Developed by Author)

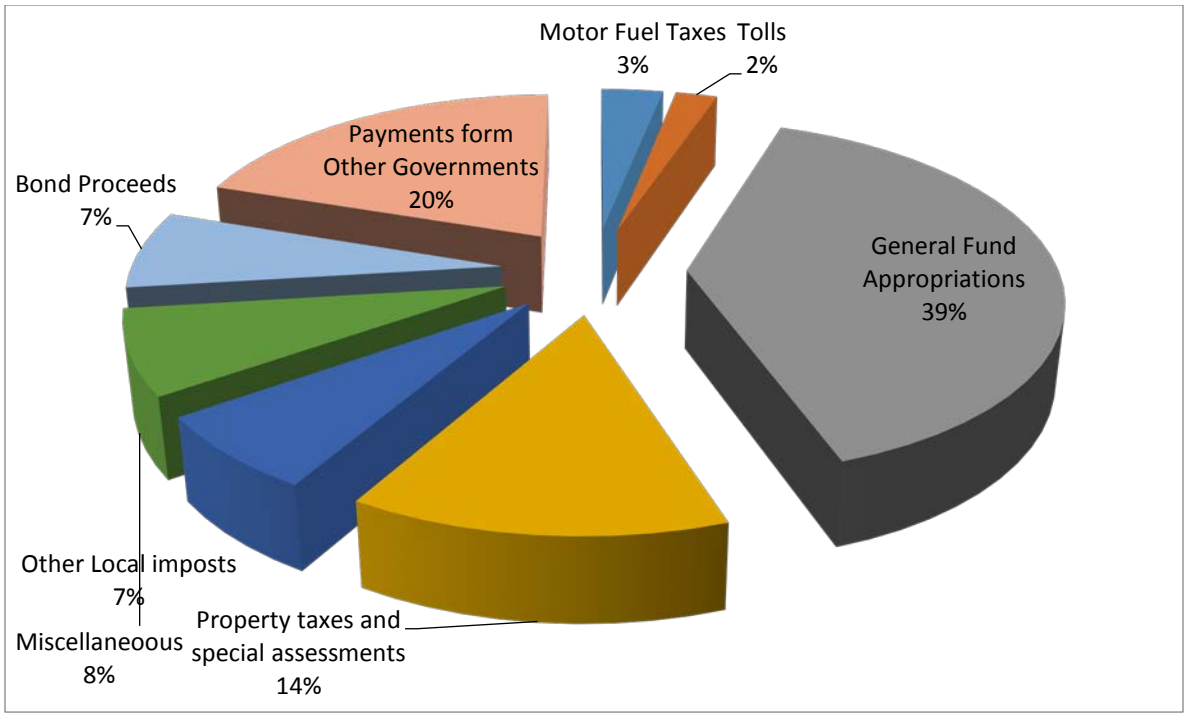

Figure G2. Revenues Used by Local Governments for Highways (Summary 2013)
(Source: FHWA, 2012: Table LGF1. Developed by Author)

General Planning Considerations

LVRR methods require an assessment of the benefit of access to improved transportation as reflected in changes in land prices. There are conditions that can be more conducive and optimal for adopting land value return type approaches by state DOTs and partner organizations. These conditions include:

- Integrated planning of transportation and land use: When transportation planning is closely integrated with land use planning, transportation infrastructure may have the ability to achieve greater benefits, since land use and transportation are closely linked. New transportation infrastructure, for instance, can help shape land uses by increasing the site access and the mobility of site users. For example, a new interchange increases the accessibility of locations in the proximity and leads to development of those sites. In addition, it may also offer existing and new users mobility and safety benefits relative to their old routes. This may eventually induce further demand and development. Ultimately, the role of transportation is to connect people with goods, activity spaces, and the people with which exchanges have to be made. Hence, states or regions with integrated transportation–land use planning may find it easier to consider such methods. However, there are several contexts reviewed in this report where such mechanisms have been adopted in the absence of such integration.
- Land use planning and regulation: Land value return methods as well as broader value capture methods require close integration with local planning and development controls since they are overseen by local governments.
- Systematic process of screening projects: Transportation planning may also work well when limited resources have been applied to select projects that best meet state DOT goals and objectives. This way the limited resources are channeled to “best” projects and other funding mechanisms may be pooled with land value return resources. Screening methods are often discussed at the project level. However, in some cases, it may be appropriate to explore the

applicability of such LVRR type mechanisms at the corridor and/or regional level where there are greater opportunities for maximizing the value created and meeting other policy objectives.

There are practical challenges however, that are to be addressed and to help bridge the gap between theory and the actual practice of land value return. These include, identification of who benefits, the extent of the benefit that accrues as a result of the transportation improvement, timing and methods to capture the value created, what are the processes needed to enable these mechanisms, and how to use it in the context of funding projects? These and other questions are addressed in the report and the accompanying guidebook.

Organization of the Appendix

The rest of this appendix is organized into three chapters. Chapter G2 discusses the domestic evidence that helps to make the case for considering LVRR and Land value return-like mechanisms. The review of local land value impacts of transportation projects is presented in Chapter G2. Chapter G3 provides a general approach for considering different mechanisms including a robust characterization of methods. The intent of the discussion is to distinguish conventional LVRR from other forms of value capture that are discussed in the literature. This is expected to be useful in informing the audience for identifying each mechanism for what they really are or are not. Included in this chapter is a general discussion of each mechanism and the myriad of issues that must be addressed when trying to implement such mechanisms in the context of specific projects. The last chapter (Chapter G4) discusses the case studies selected by the team that were selected and integrated into the resource guidebook for State DOTs.

Chapter G2. Transport Investments and Value Creation—Information Useful for State DOTs

In public finance literature and in the United States and elsewhere, the concept of land value return has become a standard practice for implementing some form of fees on land or sometimes even reforming a tax system. There are typically four requirements:

- Values must increase because of public action (like a transportation project). This could be in specific areas or it could be in relation to demand changes occurring near the sites affected by the project.
- A method must be established to value the land so as determine the change, so that the change is included as part of the taxable value of land.
- A special fee or broader tax rate may be applied to land to capture the value.
- The revenue yield must be sufficient. (Walters, 2011).

This chapter is dedicated to addressing the very first of those criteria to determine the domestic evidence on the linkages between public infrastructure and private land values. This review addresses specific questions based on the US context in order to assist state DOTs who may wish to pursue LVR type methods:

1. Where and when do impacts occur and what is the spatial dimension of impacts? Do transportation projects enhance or diminish nearby land values? How is that tied to the project type and local/regional context?
2. Do project benefits increase everywhere or only in proximity to the facility or service?
3. What is the link between access, travel time, and land values?
4. What is the evidence on land value effects with respect to freight projects?
5. How are the links between value creation and LVR gauged and used to determine benefit areas?

Resources were compiled using a variety of resources and databases, including:

- RePEc: Research Papers in Economics.
- ProQuest Databases.
- Google Scholar.
- Econlit.
- TRB-TRID.

The review is organized into four major sections linked to the key questions:

1. What state DOTs should know about transport investments and value creation?
2. What is the connection between time, access, and land values?
3. Where and when the impacts occur?
4. How can state DOTs and partner agencies create value?

What Should State DOTs Know?

The topic of highway projects and economic impacts has been widely discussed in the economic, funding, and finance literature. The literature in this arena goes back to the 1950s; however, the review for this

study focused on more recent studies, particularly from 1980s onward. In order to provide the most value to this research, the research team focused on the U.S. evidence, rather than international studies.

Throughout history, economic expansion has been facilitated by major transportation investments: the Erie Canal, the Transcontinental Railway, the Intracoastal Waterway, the Air Traffic Control System, and the Interstate Highway. All have created value to citizens in terms of facilitating travel for a variety of purposes including daily work, consumption patterns and also contributed to economic growth of the Nation. At the national level, there is general agreement that highways generate positive outcomes, but the effect has been declining over time. This conclusion is based on studies that examined links between transport infrastructure and economic productivity as measured by increased output per unit of inputs or decreased costs per unit of output (Nadiri and Mamunaes 1996; Fernald 1999; Mamunaes and Nadiri 2006). At the national and state level, they can contribute to economic output while also creating benefits at the regional and local levels.

The need for transportation projects is more complex now and the goals and priorities of different state DOTs over the years increasingly reflect (both highway and transit) broader policy effects associated with safety, emissions, air quality, and public health. Bhatta and Drennan (2003) summarize the benefits in five categories: a) increases in productivity at the national scale b) increases in output c) reduction in production costs d) effects on property values, wages and income and e) return on investment on public infrastructure capital. At the microeconomic level, transportation benefits (or costs) include the benefits to transportation system users from access and mobility improvements like travel time savings, reductions in operating costs, reliable journey times, improvements in safety and air quality. They also include economic effects to indirect parties and general public such as changes in economic activity at local, regional, statewide scales. All of these represent different measures of economic benefits, occurring at different time periods relative to the investment and accruing to different user and non-user groups.

The specific channels in which transport investments influence and create value vary. Depending on the specific context, access to local land markets and mobility are among the key sources of value creation. Transport investments also influence access to key producer markets (destinations and resource supplies), job access, lead to employment effects, speed to market, and they create other local, regional, state, and national economic activity benefits.

At the state level, Schatz et al. (2011) conducted a meta-analysis of several studies of roads within states and sub-state regions like metropolitan areas. He concluded that some highway investments could lead to positive macroeconomic benefits like productivity effects, but that such effects may occur at the cost of negative spillovers from neighboring states. EDR Group et al. (2012) conducted an export assessment of 100 projects across the country and found diverse economic effects ranging from no effects to national-level effects. These results suggest that states can create positive outcomes to their economies when they invest, but some of the gains may occur because of a transfer from neighboring states.

- At the individual project level, well-targeted investments can lead to positive outcomes. Lynch (2007) specifically noted the importance of highway project type.
- Geographic characteristics are important in generating positive outcomes (Rephann and Isserman 1994; Islam 2010; EDR Group et al. 2012; Fitzroy et al. 2014). There are fundamental differences between smaller access projects, longer distance corridors, beltways, and bypasses in terms of how they benefit host economies.

When the benefits of improved transportation are geographically limited, the value of these benefits is reflected in land value. In other words, many transportation benefits are capitalized into land value.

Access and real estate development features of projects can be important in generating land value benefits and financial impacts, especially for high-growth regions.

What Is the Connection between Time, Access, and Land Values?

Value increase is a process where the mobility and access benefits accruing to travelers on the transport networks are capitalized into land values. Stated simply, land and property values reflect some (but not all) key transportation benefits like access and mobility benefits. They also can reflect externalities like noise and pollution.

The positive effects of transportation development on land values, in relation to accessibility, have been examined extensively in the literature. Studies acknowledge that both positive and negative effects may result from proximity. Land values in different geographic areas may respond quite differently due to the effects of new transportation infrastructure development. Negative effects may result from an increase in traffic noise and pollution. Ryan (1999) noted that the degree of travel time and accessibility gains were more likely to be associated with higher land values. Figure G3 shows the connection between LVR and access.

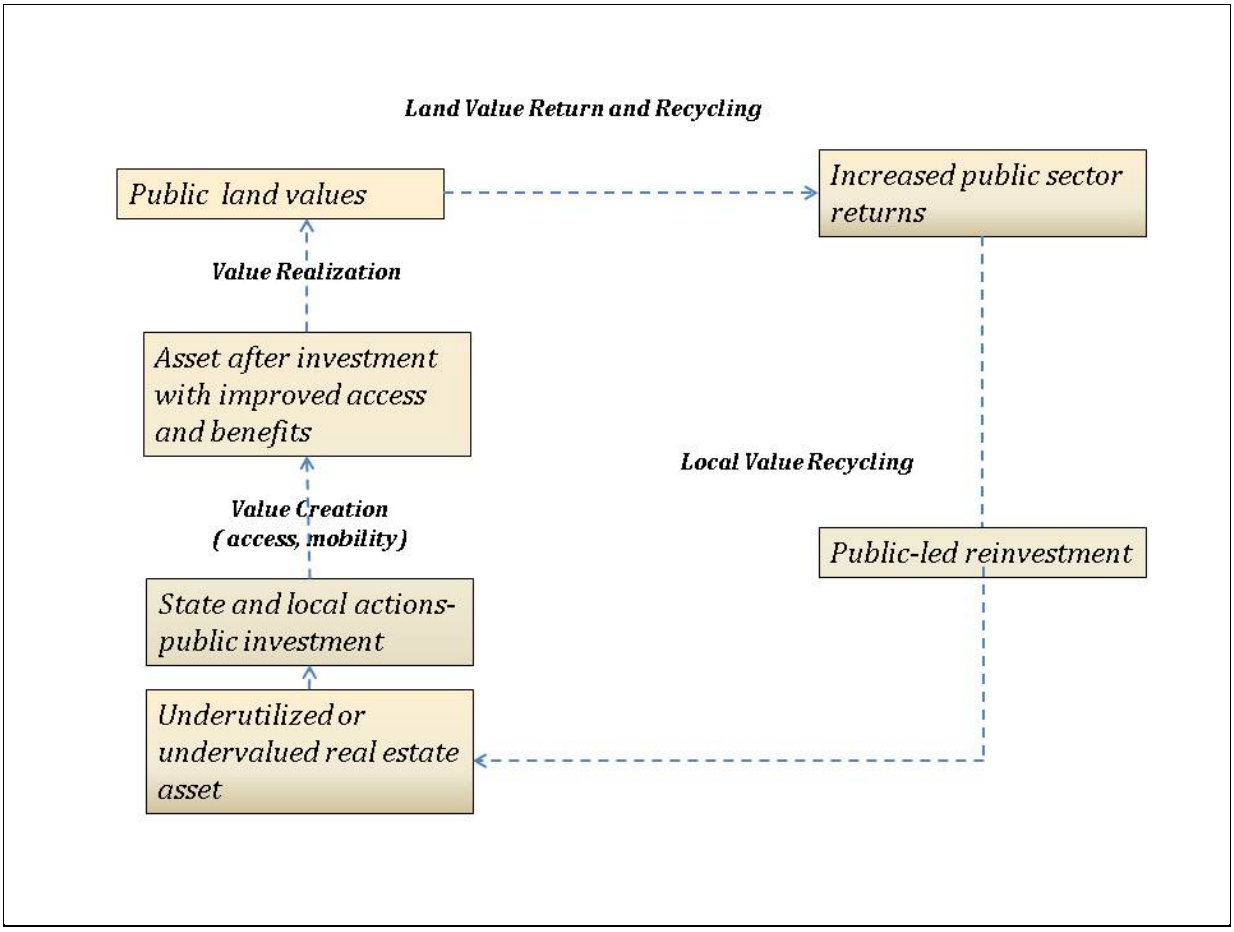

Figure G3. Land-Value Return and Recycling, Value Creation, and Access.
(Source: Adapted and Reprinted from NCHRP Synthesis 459 (Vadali 2014))

Diaz (1999) identified other important factors for determining rewards besides growth area. While these were developed in connection with transit, some are equally applicable to highways. The following factors can connect how value is created and capture of that value.

- Access to jobs.
- Access to other modes of transport (only documented in a few studies) and walkability (for transit).
- Market penetration (for transit).
- Location or integration of route with existing community.
- Potential for higher level of development with opportunities for joint development. In this case, opportunities for joint development can lead to partnerships with adjacent property owners; local jurisdictions can help join these sites into larger, more flexible sites that allow for a broader range of development options.

These factors led Smith and Gihring (2006) to conclude that transport infrastructure (transit) can be important for retail businesses, employment centers, education, health facilities, recreational activities, and travelers who prefer transit use.

There is other evidence that transport investments also influence development patterns and create sprawl. Included in this category is the study by Payne-Maxie (1980) on beltways. Handy (2002) reviewed four studies, including Payne-Maxie's, and concluded that limited-access highways and beltways more generally will not increase the rate of growth but will likely influence the location of growth and the development density. Sprawl occurs as a result of market failures and the difficulty in accounting for public infrastructure project related costs. This causes urban development to appear cheaper due to improperly priced roadway use combined with other factors, like the current tax system that taxes property (instead of land and buildings separate from property; Brueckner 2000, 2001).

Where and When Do Impacts Occur?

Highway Project Effects—Empirical Evidence

This section reviews the impact on land and property values as one manifestation of economic impacts. They refer to existing or completed projects so that the real effects of projects can be measured. They all agree that land and property values and land development do not respond in a vacuum but instead respond to stimuli impacted by transportation infrastructure decisions (highway and transit). These stimuli include changes in accessibility (to employment and business opportunities made possible by reductions in transportation costs; Alonso 1964; Boarnet and Haughwout 2000; Batt 2001).

Huang (1994) and Ryan (1999) provided extensive summaries of the impacts of highway expansion projects on residential sale prices, with the goal of establishing the economic impacts of highway projects. Huang's review found that most transportation improvements positively affect the value of nearby land. Estimates of those effects ranged from almost nonexistent to over a 10 percent increase in property values over the region-wide sale prices. Boarnet and Haughwout (2000) pointed out the effect of highways on land prices has been diminishing over time since early studies of the first segments of the interstate system in the 1950s. They made two important observations on the size and geographic scale of effects:

- As more highways are built and the highway network matures, the incremental effect on accessibility from new or improved highways decreases.
- Metropolitan highway projects still influence land use in the way that theory predicts. A new highway or improvement might reduce travel times in the immediate vicinity of a project, even if the resulting changes in transportation accessibility are small.

Models like those of Alonso (1964) and others suggest that corridor improvements (highways and transit) will influence urban form. Table G1 presents a review. Some previous studies were conducted on very broad scales, yet the effects were concentrated in geographic proximity to the project.

Highway Catchment Areas or Geographic Influence Areas

Batt (2001) examined how the transportation infrastructure of the Capital Region of New York State could have used some form of LVR with success. He showed how a portion of the New York State Interstate Highway System, a 9-mi stretch of I-87 known as the Northway, could have been financed from land value increases in the corridor. His method relied on the use of catchment areas that varied from 0.25 mi to 2 mi on either side of the highway. Similar findings were arrived at by Zhao (2014) for Trunk Highway 601 in Maple Grove for a smaller catchment area near the highway, as well as for urban and suburban areas in the Dallas metroplex (Saginor et al. 2011). After evaluating the impacts, Zhao recommended four methods for the 601 corridor in Minnesota:

- Special assessments.
- Impact fees.
- Tax increment financing levies on future property value growth.
- Joint developments where the owner/developer pays or makes a financial contribution to offset costs for adjacent transportation facilities.

To date, no approach has been adopted for the 601 corridor.

Table G1 provides a summary of highway project and geographic areas associated with observed land value effects. At least five of the studies listed were research projects sponsored by state DOTs, and one was research conducted for the state legislature. The list is not intended to be a comprehensive review; instead, it focuses on more recent or striking studies. For decision makers, the following observations can be of importance:

The geographic area of positive effects vary, but typically, positive effects are seen beyond 0.25 mi, and they are often limited to no more than 2 mi (with a few exceptions seen in the literature).

The abutting zone effect is such that positive effects from access may be canceled due to negative effects like noise and emissions for those within 0.25 mi. In secondary areas adjacent to abutting zones, the effects can be positive. The effects (positive or negative) can be influenced by land use controls, but it was not always clear in the literature how or if these were accounted for.

In most cases, simpler measures like buffer zones often define the process by which value increases are examined and developed. Other measures, like ramp access (access to nearest exits) or highway distance accessibility measures, are used to measure effects. In other contexts, distance measures of access from the facility are used in combination with access to other regional centers of activity.

- Different project types are quite different in their effects. Beltways may or may not always lead to positive effects. Differences in impact are bound to occur based on growth areas. Concerning timing of effects, many projects observe appreciation effects in the long run after completion. A few do note announcement effects before project start.
- Higher volumes of truck freight are associated with negative effects for residential properties but can have positive effects on rural land, industrial and commercial land particularly at access points.

Table G1. Land Value Impacts of Highway Investments (United States)

Author (Year)	Highway System	Value Measure	Catchment Area	Location/ Growth Area	Value Increase
Palmquist, 1982	Interstate 405 and Interstate 5	Property value—residential	100 ft–5900 ft from the highway.	King County Seattle/high growth.	Properties closer sell at a 12–15% premium more than others further away.
Gamble et al., 1974	Interstate 495	Property value	4000 ft of freeway.	Virginia/high growth.	$2950 associated with increased accessibility.
Batt, 2001	Interstate 87	Property value	0.25 to 2 mi from the highway.	Capital Region of New York/high growth.	831% (for the 2-mi radius on either side).
Zhao, 2010	Truck Highway 601	Land value and building values (residential, vacant, commercial, farm land, utilities)	Up to 0.05 km near exits.	Maple Grove, Minnesota/Sub urban medium growth	$1612/acre premium for 0.1 km. Access to ramp exits.
Saginor, 2011	Several roadway types (state highways, tollways)	Property value	0.25 to 1 mi from roadway hot spot analysis.	Dallas, Tarrant, and Collin Counties/high and medium growth.	−2.4% to 22% for 0–0.025 mi, 1.4%–19% for 0.25–0.5 mi, 6%–39% for 0.5–0.75 mi, and 7.8% to 47% for 0.75 to 1 mi. Closest areas up to 0.25 mi tend to lose value.
Siethoff and Kockelman, 2002	US 183 (Research Blvd.)	Assessed property value, land value (multiple uses) but mostly commercial	0–0.5 mi.	Northwest Austin/high growth.	Specific location access relative to corridor corner access. Premiums for various improvement types. Highest for financial services.
Carey, 2001	Superstition Freeway/US 60	Property value	Half mile impact zone. Beyond half mile were included in control.	Phoenix, Arizona, medium growth.	Benefits accrue to properties in the long run (after construction).
Carter et al., 2003	Highways and radial thoroughfare (11 included in the study)	Property value (apartments)	Metro wide (urban and rural areas).	Metropolitan Baltimore for 11 thoroughfares/ high-medium growth.	Premiums associated with proximity in the long run. Beltway related results were not very conclusive.
EDR et al., 2012	Transportation project impact case studies	Property value changes with other metrics of value created	Not defined.	Nationwide/ different growth types.	Based on median house values only.
Mikelbank, 2005	Smaller investments in roads and bridges	Property value (residential)	Area wide, network distance.	Cuhayoga County, Ohio.	1% increase in infrastructure leads to 0.1% in house prices.

Author (Year)	Highway System	Value Measure	Catchment Area	Location/ Growth Area	Value Increase
Mikelbank, 2004	Interchanges and highways	Property value	0.25 mi from highway, proximity to exits.	Cuhayoga County, Ohio.	Negative premiums 7% discount and positive premiums beyond 0.25 mi and announcement effects.
Kawamura and Mahajan, 2005	Truck traffic	Property value	Area wide, not explicit.	City of Chicago.	10% volume increase decreases house value by 0.4%.
Boarnet and Chalermpong, 2001	Orange County toll roads	Property value	1125 ft to 1 mi.	Orange County, CA/high-medium growth.	Positive premiums.
Vadali, 2008	Dallas North Tollway	Property value	0–0.25, 0.25 to 0.05, and 0.5 to 1 mi.	Dallas County, TX/high growth.	Highest premiums for some sections of tollway with multiple transport options.
Concas, 2013	State Route 836 Extension and Reversible Lane System Selmon Expressway	Property value	Limited to areas close to intervention.	Florida, Miami Dade County 34 census blocks/high growth.	4.5%–5.2%. Rapid growth area. Upper-income neighborhood (SR 836). 3.4%–4.6% (reversible lane system).
Palmquist, 1980	Several cases in Washington	Property value, multiple uses (residential, commercial, industrial)	Areas close to projects.	King County, Kingsgate Bellevue areas.	12% premium Kingsgate. 15% King County (of home price) related to access for commuters and mobility improvements. 16% Bellevue. New highways have positive effects on commercial and industrial land.
Reibel et al., 2008	Interstate 210 Extension (28 mi)	Property value	4 areas close to the highway, identified natural decay patterns.	San Dimas to Realto, CA, completed in 2002 (high growth).	Rapid appreciation. Homes closest (0.4 mi) showed the lowest appreciation. One additional mile away is associated with an increase of $18,276 first year after opening. This increases each year.
Li and Saphores, 2012	Truck traffic along Interstate 710, Interstate 110	Residential, property value	Immediately adjacent (up to 400 m).	Area between Ports of Los Angeles, Long Beach, and Downtown, California. High growth.	Price elasticity of truck traffic is −0.6589. An increase in truck freight will reduce the value of a home between 100–200 m of the freeway.

Interchange Projects and Bridge Projects

Several studies showcase the economic impacts of interchanges on the local and regional economies as well as development without actually documenting the increase, if any.

Moon (1987) shows that rural interchanges and highways are catalysts in converting undeveloped rural land to urban uses. He looks at the nonurban impact of the Interstate Highway System by examining 65 nonmetropolitan interchanges in Kentucky in 1985. He analyzes not just the cyclic pattern of evolution of nonmetro interchanges but also discusses possible developmental effects for these previously remote and isolated interchange sites by examining a half mile radius around the interchange (502 acres). Nonmetro interstate interchanges often vary according to different functions that they perform, with some acting as interchange villages in performing the role of central places in their regions. It identifies the following factors as paying a key role in the transformation: a) prior level of development b) location inside and outside the Appalachia c) distance to the nearest interchange d) traffic volumes and e) terrain and topological conditions.

Kusmin et al. (1986) identify characteristics of rural areas conducive to economic growth for 1979-89. In their analysis of rural areas, access to interstate highway interchanges contributed to earnings growth in rural areas, although the relationship is not among the most important factors in the analysis. Each interchange brought approximately 0.42 percent additional income growth during the period.

A 2012 study examined the Interstate 71 Interchange in Cincinnati (Economics Center, 2012) and documents employment effects from improved access to the employment centers in Uptown Cincinnati and positive development effects associated with current vacant or underutilized land. The uptown area is associated with concentration of professional employment. A second study of Interchange-71 (SR 37) (US 36) (Baxtarr Consulting Group, 2011) also demonstrated positive economic impacts of the interchange to Delaware County including jobs from industrial and commercial development (from rezoning), fiscal effects from sales taxes and property taxes. They went on to use the results of the economic effects to suggest the use of different methods to fund the interchange including tax increment finance encompassing property tax increments, retail sales tax increments and also a payroll tax on workers in the area.

Studies by Wary et al. (2000) examine seven urban interchanges (three in Philadelphia and four outside Pennsylvania) (I-91 and Massachusetts Turnpike, I-87 and New York State Thruway, Interstate 494 Interchanges in Bloomington, Minnesota) and note that predicting effects are difficult but make the following observations in growth areas:

- Interchanges between two highways have a positive effect on access to nearby business and commercial markets, which can lead to increased development.
- Increased opportunity for industrialization or opening up of old industrial for higher uses like commercial uses.

For distressed areas they note, that the interchange is unlikely to have a major effect on development. They also note that the presence of sensitive environmental land in close proximity can hinder development. They also note that the design of the interchange can be an important for development potential. No effects were noticed on Houston's Beltway-8 interchanges. Interchanges on I-494 in Minnesota showed mixed results on development.

Strathman and Simmons (2010) specifically investigated alternative funding methods for specific use in the context of interchanges in Oregon. Oregon has a long-standing history of integrating land use and transportation and Oregon DOT is more involved in land use aspects when the local planning and development affect state transportation facilities. Their approach is geared toward funding and preservation of existing capacity rather than considering new capacity. The methods include impact fees, tax increment finance, and other forms of LVR and LVR-like methods like utility fees. They note that development pressures around state facilities result in a need to increase capacity and to fund improved facilities. They note that collaboration with local governments is the most near interchanges, which offer prime access to commercial activity centers.

EconNorthwest (2010) examined the economic and development effects of the SR-35 Hood River Bridge, which connects communities in Washington with Hood River in Oregon. The study sought to examine the

economic effects of replacement in order to determine the feasibility of replacing the bridge. The Sydney Harbor Bridge is one example of a bridge project financed by a form of LVR, known as a betterment levy. A portion of the costs of the Bridge were funded through a betterment tax on property owners who benefited from the harbor link. The levy itself was only 0.2 per cent on unimproved capital value of the lands, over a 15-year period (Prosper Australia, 2016).

Freight Intermodal Projects

A recent study of freight nodes like intermodal freight terminal/logistics centers (Will County, Illinois) identified that industrial property values along key trucking corridors near the facility were associated with higher assessed values (McNally 2014). A tax increment finance zone (TIF) was established. The TIF was however not established in connection with the facility improvement itself.

Transit Projects: Empirical Evidence

This section provides an assessment of transit studies. According to the Urban Land Institute (Campbell 2013) reports on evidence from two U.S. studies, two international studies, and a review of multiple studies, transit investments can result in increases in property values for nearby communities. In some studies, effects are insignificant or negative—these are often associated with proximity to the transit line.

Transit Station Geographic Influence AreasTable G2 provides a brief summary of selected transit in studies and geographic areas of interest.

Table G2. Land Value Impacts of Transit Investments (United States)

Author (Year)	Transit System	Value Measure	Catchment Area	Location	Premium Rate
Perk and Catalana, 2009	Bus Rapid Transit (BRT)—Martin Luther King, Jr. East Busway	Property value	Distance measure from BRT	Pittsburgh	Significant and positive
Al-Mosaind et al., 1993	MAX LRT	Property value	450 m (0.28 mi)	Portland	10.6%
Weinstein and Clower, 2002	DART LRT	Property value	400 m (0.25 mi)	Dallas	−5.2% (1999), 13% to 18% (2002)
Duncan, 2008	Light rail	Property value	400 m (0.25 mi)	San Diego	5.7% to 16.6%
Landis et al., 1995	Santa Clara LRT	Property value	275 m & 400 m (0.18–0.25 mi)	Santa Clara	10.8% to 45%
Garrett, 2004	St Louis Metrolink LRT	Property value	300 m (0.19 mi)	Missouri	32%
Sedway Group, 1999	Bay Area Rapid Transit (BART)	Rent premium	400 m (0.25 mi)	San Francisco	5% to 26%
Gruen, 1997	METRA, commuter rail	Property value	400 m	Chicago	20%
Armstrong, 1994	Boston Commuter Rail	Property value	400 m	Boston	6.7%
Voith, 1991, 1993	Commuter rail	Property value	400 m	Pennsylvania	+10% premium for median home price in census tracts served by rail line +3.8% premium for median home price

Author (Year)	Transit System	Value Measure	Catchment Area	Location	Premium Rate
					in census tracts served by rail line
Saginor, 2012	Light rail, commuter rail, highways	Property value	1-mi hot spot analysis	Dallas, Tarrant, and Collin Counties	Premiums noticed for light rail up to half a mile from transit line
Boyce et al., 1972	Lindenwold Heavy Rail	Property value (residential)	—	South New Jersey	$149 (1971 $) per dollar of value in time savings
EDR Group et al., 2016	Several examples	Multiple impacts include property values	NA	Multiple market settings	Property value effects reported, premiums not noted

How Can State DOTs and Partner Agencies Create Value?

LVR is a type of public finance that seeks to capture part of the value increase in land created by public infrastructure to help pay for the capital, debt service, and/or operating costs of that infrastructure. New and improved public infrastructure investments such as transportation facilities can increase land values, creating increased values for private landowners and increased fiscal effects like increased tax collections for local government. Improved infrastructure may also increase the potential for development when conditions are right, which can further increase property values, local taxes, and even sales and income taxes collected by local and state governments. According to the Urban Land Institute, forging these connections with land use may provide a way to pay for transportation infrastructure (Urban Land Institute, 2013).

Capitalization, on the other hand, is the process agencies like state DOTs and partner organizations should recognize as a pathway to creating value well before an improvement (Mohring, 1961). The capitalization effect can then be reinforced by higher intensity of development in a corridor or clustering in land development. Mohring suggested that returning portions of the capitalized value added from highway and transit improvements is an effective way of covering infrastructure costs for capital investments. Transportation decision makers play a significant role in creating these stimuli through the various projects, policies, and plans they elect to undertake. The relation is dynamic since it can occur continuously through the transport projects developed (Lari et al. 2009). The changes in access and mobility increase the demand for land and lead to increases in land values. There are three ways state and local agencies can create value. They can:

- Influence the accessibility of land via transport infrastructure investments that agencies select and implement. This refers to the broader transportation planning functions that state DOTs and metropolitan planning organizations oversee by way of project selection and screening.
- Influence the amenity value of land via externalities like environment, pollution, safety through the other policies they adopt. This refers to the broader policy goals that frame and guide the projects that state DOTs and metropolitan agency include in their plans for the regions in their jurisdiction.

- Influence and maintain the value of land though land use regulations. This refers to complementary actions led by other local agencies that can support and create conditions necessary for the success of such methods.

In actual practice, the ability to implement capitalization strategies is partly determined by factors that are in control of local government appraisal districts like digitization of parcels, and appraisal and assessment methods that are smart to recognize these interactions.

Conclusions

The studies reviewed indicate that transport infrastructure over which state DOTs (and organizations like MPOs and transit agencies) have decision-making power can have location-related effects (both positive and negative). These findings suggest:

The land use effects of modern transportation projects are likely to operate over a geographic scale that is rather close to the project. If the corridor serves "through" traffic and if unaccompanied by other access features the effects will occur at locations other

- Indirect beneficiaries of transport investments are residents, developers, agricultural land, and commercial and industrial landowners. They may not all use the facility. Indirect beneficiaries also include local governments that host the highway sections being improved due to the likely influence of right-of-way acquisitions on the tax roll and the real estate response to the improvement, which will affect existing properties and growth. A second category of implied indirect beneficiaries are the local governments that host the sections of the highways undergoing improvements under the assumptions of major influence of right-of-way acquisitions on tax roll and that real estate responds to the improvement by influencing not just already developed properties but also lead to new growth. In principle, this growth may or may not be a spatial transfer of effects that could occur anywhere in the area. Local governments benefit from higher revenues.
- There is a connection between the size of the primary benefit—access and mobility improvement—and the indirect benefit—land values and development. The influence areas for highway projects are typically well within 2 miles of the freeway or highway. Spatial correspondence can often be measured by simple distance, but benefits to specific areas and uses may also be examined by considering proximity to ramp exits. One of the key assumptions is that the catchment area captures a large part of both origin and destination trips. This assumption will not hold if the highway serves as merely a conduit to another area or has a large volume of through trips. The more general approach to access, versus simpler distance-based measures, presumes that catchment areas may be quite different. Very few studies examined catchment areas and used simpler thumb rules.
- Areas adjacent to line-haul networks like roadways and rail are typically associated with negative effects, especially when the adjacent uses are residential. Higher volumes of freight traffic will have a negative effect due to noise. No studies were found that examined effects on commercial or industrial land. A negative effect is sprawl, where there is outward development, which should be considered as a policy consideration with any funding method including LVR type methods.
- The review confirms the findings of more general economic impact studies that geographic characteristics of a project do matter. The actual size of benefits is based on growth area type (high-, medium-, or low-growth area as an indicator of general real estate and macroeconomic conditions), whether the location is urban or rural.

- Few studies examined the effects of land and improvements separately, although LVRR methods can benefit from a separate assessment. The typical analysis unit was combined property value. If, however, the overall property value effect is positive, it is likely that that land value effect is also positive and land is more valuable.
- One study suggested that freight-oriented developments like logistics centers with higher levels of development and clustering might have higher industrial land values along nearby highway corridors. The example studied in this report included a logistics cluster and its real estate impacts in response to external influences and freight moving from a different origin location to the center as a destination. However, the study did not examine or isolate the effects of improvement on any of the adjacent corridors or at more distant locations generating the freight.
- Interchange project impact studies conclude that predicting development effects is difficult, but that the development effects are more likely to ensure when accompanied by use of appropriate land use controls. At least two studies have examined the potential for economic and development-related impacts to provide a basis for working with local governments and use of alternative funding mechanisms.

Transportation projects are diverse. Many methods can be used for a project, but all projects cannot use the same method. Agencies can recognize the interdependencies and maximize value through policies and actions they adopt. Regional and corridor methods can address some

- The ability of a project to make significant improvements in access is important. Developers must recognize that significant changes in access are needed to generate new development or a critical bottleneck must be addressed. An example is real estate developments, like those observed at terminals and logistics centers where access considerations can be addressed.
- Limited availability of funding for transportation projects necessitates that state DOTs select projects that maximize benefits. Focusing on LVR can help state DOTs select projects that deliver value while ensuring that successful projects will be financially self-sustaining, at least to a greater degree than in the absence of such methods.
- Transportation facilities are rarely isolated, stand-alone projects. Typically, they are part of larger, multimodal transportation systems and networks. Thus, transportation projects can create impacts at distant points in the system. State DOTs should recognize which project types create the greatest benefit to state economies and note that some investments can lead to benefits at localized regions within the state. Limited evidence suggests that spatial links with other regions can also lead to economic benefits and land value effects in other regions, and to specific nodes of development, like inland ports and logistics terminals.
- Transportation projects are very different in how they can influence land and property values. The effects can be spatially concentrated in geographic locations, but can also be diffuse based on typology of traffic flows. The effects can vary in timings suggesting that effects can occur early (announcement effects) in a project or later.
- The size of the effects can be large, small and/or negative. This suggests that the same LVR method cannot be considered for all project types. Similarly, it also suggests that more than one method can be applicable for a single project. A potential solution is to consider regional or corridor approaches to funding. Agencies can recognize the interdependencies and maximize value through policies and actions they adopt.

- Finally, the land value impacts have little or no relation to project related construction costs. There is a wide variation between land value benefits and construction costs. The magnitude of the capitalization effect will be guided in large part by the maturity of the network at the location and the exact nature of the intervention.

Chapter G3. General Framework for Examining Land Value Return

This chapter presents a general framework for discussing and selecting LVR and LVR-like methods based on a detailed discussion of a variety of considerations that will generally differ across methods: funding, policy, fairness and equity, legal/legislative, administrative issues, and political issues. It ends with a discussion of implications for transportation planning.

Funding Considerations

Since it is difficult to pay for public goods and services in the same way that we pay for private goods and services, two principles could serve as a basis for payment.

Beneficiary Pays Principle and Beneficiaries

Land value return methods exemplify the beneficiary pays principle. According to this principle, people and businesses (beneficiaries) who benefit from roads, transit, and other public goods and services should help pay for infrastructure construction, maintenance, and replacement (bear the cost of use of the facility). The principle, by definition, requires identification of beneficiaries.

- Direct Beneficiaries: Those who benefit directly from using the infrastructure might pay a fee per unit of consumption. These types of payments are referred to as user fees. Motor fuel taxes are an example of user fees. User fees such as motor fuel taxes, levied on fuel and not property, do not return the increased value of land related to transportation infrastructure.
- Indirect Beneficiaries: As mentioned above, the value of land will reflect how a community provides and maintains its public goods and services. Thus, landowners benefit from infrastructure even if they do not use it personally. Landowners are just one class of indirect beneficiaries who realize the infrastructure benefits in terms of land value gains. Likewise, auto drivers may benefit from transit to the extent that transit use reduces the number of vehicles on the road and thereby reduces congestion.
- Future Beneficiaries: Most physical infrastructure has a long, useful life. For this reason, future generations will benefit from these facilities, so it is reasonable that they help pay for them. This is the rationale for infrastructure financing that borrows money that is then repaid, in part, by future beneficiaries.

In the 1890s, the streets of Washington, DC, were mostly unpaved. In dry weather, the roads were dusty and rain made travel difficult. Paving the streets and sidewalks would clean the air and make everyone better off. Congress could have chosen to pay for street paving out of general taxes. Congress realized, however, that property owners adjacent to the paved streets would receive an additional benefit beyond the general public benefits. No longer, would people track dust, mud and manure into adjacent homes and businesses Even if these property owners never walked on the newly paved streets or sidewalks, they would benefit financially through higher rents and sales prices. Therefore, Congress enacted a law mandating that 50 percent of the first-time cost of street paving would be paid for by adjacent landowners (DC Code 2001).

Also during the 1890s, the Chevy Chase Land Company (CCLC) bought about 1,700 acres of land near the Washington, DC–Maryland border. This land, primarily agricultural land and forest, was relatively inexpensive because it was difficult to get from this location to jobs and stores located downtown. Then, the CCLC built a streetcar line from downtown Washington, DC, to the Chevy Chase community. The streetcar fare was relatively modest and did not compensate CCLC for the capital costs of the streetcar. The CCLC recouped its costs and more, not through fare box revenue but through increases to the value of the land (Leinberger 2010). If the CCLC had attempted to recover all of its streetcar costs through

higher fares, very few people would have ridden the streetcar and land values in Chevy Chase would not have increased.

These examples show that, at least for some types of infrastructure, landowners benefit from mere access—even if they do not use it directly. Infrastructure-created land values are an often overlooked but potentially important source of infrastructure funding (Batt 2001; GVA Grimley 2004). Tapping publicly created land values for infrastructure funding is the essence of LVR and recycling. Some even call it an access fee (Rybeck and Rybeck 2012).

Funding Methods

Value capture methods have been discussed in several reports about infrastructure funding and finance including recent research reports (See for example, Page et al. 2017). The reason is because land value return and recycling mechanisms, as we define them, have a unique capability to internalize economic externalities associated with transportation infrastructure. This capability can be instrumental in helping transportation projects achieve intended outcomes while avoiding negative, unintended consequences. Thus, when selecting funding mechanisms for particular projects, it is important to know each mechanism's incentives, disincentives and whether they are consistent with the intended goals of the transportation project that they might fund.

Following is a description of the broad categories of funding methods, including LVR methods**:**

- User fees: Users fees and other direct beneficiary charges are not directly the subject of this research. However, the incentives associated with user fees are important and can complement those associated with other land value return and recycling as well broader value capture techniques. Establishing an appropriate balance between user fees and land value return methods is important for meeting the goals and objectives of infrastructure investment.
- DIFs, Exactions and Proffers: Development impact fees are typically one-time payments by developers (and ultimately the purchasers or renters) to compensate the public sector for additional public-sector costs associated with new private development. They are typically associated with "adequate public facilities" ordinances. In order to avoid a violation of the "takings" clause in the Fifth Amendment to the Constitution, the amounts of these payments are legally required to be (1) related to and (2) proportional to the anticipated public infrastructure costs associated with and required by new private development.

The fees are typically determined by the size, character or value of private development in accordance with studies that purport to show a relationship between the size, character or value of private development and the cost of public services that such development requires. Thus, although there is a nexus created by private-sector costs imposed upon the public sector, these fees may be more accurately described as cost reimbursement.

DIFs anticipate future increases in public spending associated with proposed private development. They are better suited to suburban fringe or rural areas to help ensure that developers—who take advantage of low suburban or rural land prices (low because of the relative lack of public services) and whose developments generate a demand for increases in public services—do not then shift the cost of these service increases onto other taxpayers living outside of the new development.

Exactions (or proffers) are one-time, in-kind infrastructure facilities provided by a private developer in exchange for development permission. Their rationale is similar to DIF. The public sector does not want all taxpayers to subsidize the provision of infrastructure that will primarily benefit only a few taxpayers in a particular private-sector development. However, instead of a payment to offset public infrastructure costs, exactions are in-kind infrastructure contributions required from private developers. These contributions are negotiated on a case-by-case basis. Exactions must avoid violating the "takings" clause of the Fifth Amendment to the Constitution. Thus, a jurisdiction must demonstrate that the in-kind

contribution of infrastructure would (1) otherwise be required of and borne by the public sector and (2) that the in-kind requirement is no greater than would be required to meet the needs of the private development. Thus, a jurisdiction might require a developer to provide a new signalized intersection and dedicated turn lanes where the development meets a nearby arterial road. However, requiring the developer to build a new highway interchange a few miles away (that would benefit other properties as well as the new development) would probably be excessive. Exactions are more accurately described as *cost avoidance*.

- Land-based access fees: User fees are often based on some unit of consumption such as a per-gallon fee on drinking water consumed or a per-mile transit fare or roadway toll. However, what about the owners of vacant lots? They do not consume any water or use the roads surrounding vacant sites. However, the value of a vacant lot is higher if water and sewer services are available at the property line and if the transportation network provides safe, convenient, and affordable access to important destinations. Thus, the value of some public goods and services is reflected in the land value of well-served sites. Even if there is no use of public goods and services there, mere access to the public goods and services creates value. Therefore, returning some portion of publicly created land value to the public sector is a primary type of LVR.
- Other forms of land value return or land value return-like methods:
    - TIF: TIF is an arrangement based upon an assumption about how new infrastructure creation and private development will impact the revenue streams of existing taxes and fees. A typical assumption is that, but for the new infrastructure, these revenue streams would remain static in a TIF-designated area or district. Property owners, businesses within the district pay the same taxes and fees that they would in the absence of a TIF district. However, instead of all revenue going to the general fund, the increment amount is allocated to an account dedicated to pay for new infrastructure. Because these new revenues are assumed to be the result of new infrastructure investments, they have been characterized by some as value capture. However, tax rates within a TIF area are the same as elsewhere. A typical TIF is not "LVR" to any greater extent than are the existing benchmarked taxes and fees. Thus, TIFs may be characterized as revenue segregation to promote infrastructure financing. They are LVR-like methods, in that they try to achieve the outcomes when typical LVR cannot be established.
    - Payroll taxes, sales taxes and other taxing measures are not LVR or LVR-like methods. They are more general taxes and are sometimes used in conjunction with LVR and LVR-like methods.

Policy Considerations

Much like user fees and their effects, LVR and recycling mechanisms have varied incentive effects. Not all the effects have been well researched in the literature, however, it is important to be aware of these incentive effects because they can influence the evaluation criteria.

Incentive Effects

Similar to user fees, which can lead to conservation, land value fees, if properly structured, can create beneficial incentives. Absent a land value fee, landowners might be inclined to forego development of well-served sites on the assumption that these sites might become even more valuable in the future. When landowners withhold prime sites from development at current market prices, it can create an artificial lack of developable land. This artificial shortage can result in real increases in land prices as developers bid for a limited supply of development sites, which in turn can encourage even more speculative land hoarding (Rybeck and Rybeck 2012).

Land speculation can become a self-fulfilling prophecy. Withholding prime land from development shrinks the supply of development sites, which leads to land price increases, more withholding of prime sites from development, and even more land price increases. However, this self-fulfilling prophecy can become a self-defeating prophecy. If residents and businesses are priced out of the market for prime land, they will be forced to locate on cheaper and perhaps more remote sites. This impairs their productivity (typically through higher transportation costs) (Bloomberg 2015) and causes other consequences, like environmental damage and strain on municipal budgets. Once a development threshold has been diverted, speculation can lead to higher prices and the essential links to willingness to pay may be lost (Kushner 2010; Rybeck and Rybeck 2012).

Effects on Smart Growth and More Affordable Land

If properly designed and implemented, land value return methods can encourage smart growth and lead to more affordable land. This may seem counterintuitive. Typically, charging a fee for something makes it more expensive. After a fee is assessed on the value of land, however, there is no reduction in the supply of land. Further, charging a land value fee reduces the windfalls that landowners receive from public infrastructure. This reduces the motivation for land speculation and land hoarding. Reducing the speculative demand for land can help keep land prices more affordable and lessen both the peaks and valleys in real estate prices associated with typical boom-and-bust cycles. For example, Pittsburgh shifted property taxes off building values and onto land values in 1913. As a result, Pittsburgh experienced a much smaller decline in land values than other large cities during the real estate crash that preceded the Great Depression of the 1930s, suggesting that this technique successfully reduced speculation-induced land price inflation (Williams, 1962; Schalkenbach Foundation, 1963).

Additionally, fees on high-value sites can provide motivation to develop these sites in line with market demand. This happens because landowners cannot avoid a land value fee since they do not control the value of their land. Thus, owners of high-value sites are motivated to obtain revenue from which to pay the fee. This would come from utilizing the site or selling to someone who would. Where market demand for development is low, land values, and the associated land value fee, will be low, and there is less economic pressure for development of low-value sites. A simple example of how this can occur is discussed in Appendix A.

In summary, economic windfalls from public service externalities can encourage land speculation and drive development away from high-value sites near infrastructure. Land value fees can discourage speculation and create an economic need to develop high-value sites. High-value sites tend to be infill sites near existing urban infrastructure facilities (like transportation hubs) and are the places where development could be directed to realize the benefits of existing infrastructure investments and avoid the negative effects of sprawl (DiMasi 1987).

Land Value Return Funding Revenue Yield: How Significant Is the Yield as a Funding Source?

In 1995, the pension fund that owned an obsolete railroad yard south of Ronald Reagan Washington National Airport in Arlington, Virginia, sought development rights for several hundred acres located in Arlington County and the city of Alexandria, Virginia. Now known as Potomac Yards, permits for this site were denied because of the traffic congestion during peak travel times on Route 1—the only available road for auto access to the site. However, the permitting authorities noted that a rail transit line ran through the property. If a transit station were provided at the site, the authorities would reconsider granting the development permits. The pension fund offered to pay 100 percent of the cost of a new rail transit station at that location (Dougherty 1995).

Was the private-sector proposal to pay 100 percent of the cost of a new transit station a result of unique circumstances, or could it be replicated for other infrastructure projects? The ability of a single landowner to internalize most of the positive effects associated with a new facility is unusual. Typically, there are

multiple landowners in a projects' influence area. Multiple land ownership complicates the arrangements by which this value gets collected, yet coordinating the collection of land value from multiple landowners is a role that most municipal governments are capable of filling. A similar finding was indicated for a stretch of I-87 (Batt 2001).

Revenue Stability and Predictability

The revenue yield, stability and predictability of recurring methods like SADs and TIFs is important for determining bonding or debt capacity and can be related to some of the following factors:

- Extent of land values that increase because of infrastructure. There are numerous studies of the impact on land values, which, not surprisingly, show a wide range of effects, as demonstrated in the literature review. Some key determinants include:
    - Value or usefulness and scale of the infrastructure to users. Several examples discussed in this report, including those noted by Batt (2001) and the Potomac Yards example, suggest that such methods can be very successful and pay the full cost of the facility. The Denver Union Station redevelopment project, which serves as the hub for Denver's light rail network, captured $135 million of its $446 million cost through value capture dollars, or roughly 30 percent of the project's capital cost. Yet, there can be situations when values can also decline due to poor location or siting of environmental facilities. Value of the facility itself can be related to factors like:
        - Project type and changes in access and connectivity provided for the users.
        - Catchment area: A larger catchment area is clearly more revenue generating than a smaller catchment area, but a larger catchment area may have negative effects on the local government general funds with TIF. A point related to this is the number of properties and land uses included.
    - Economic conditions. Values can decline due to poor macroeconomic conditions. High-growth areas do better than others. In depressed conditions or lagging regions, there is some evidence that transport can support land values, but that does not ensure high yields.
    - Timing of capture. If value is not captured early enough, land value gains may already be transferred. The literature review provides several examples of announcement effects. Announcement effects were noted to be quite clear in the case of New York Avenue Metrorail Station (now known as NoMa-Gallaudet Metrorail Station; Rybeck 2004). Thus, yield is related to timing of capture.
- Extent of new development or clustering in the area. The financial effects are not just associated with the tax base that already exists but the ability of the project to stimulate new development. This in turn is related to real estate conditions. The revenue yield of DIFs is entirely driven by this factor, both on site (near the project) and off site (anywhere else in the area).
- Presence of existing methods. The existence of methods that are already being captured affects the revenue yield of TIFs specifically since they can be established with or without multiple taxing jurisdictions.
- Length of lease and site valuation. These are important for determining revenue yield of joint developments and air rights.
- Types of land uses that are included and tax liability, if applicable.

Fairness and Equity

The fairness and equity of such methods are important in selection of methods. Fairness and equity have been discussed in the literature (Lari et al. 2008, Vadali, 2014). Equity is closely related to efficiency of the fees, how they are established. More specifically, equity and fairness are related to:

- The ability of the methods to reflect the relation to benefit and/or the costs imposed. Hence, adherence and conformity with the beneficiary principle can ensure equity in terms benefits received or costs imposed. Some LVR and LVR-like methods, translate these provisions into "rational nexus" requirements. In other cases, the requirements need to be translated into efficient pricing of services received.
- Other forms of equity refer to those that can occur geographically or related to income or ability to pay. Of these, the former or geographic equity in the context of land value return and recycling and land value return-like methods is addressed by identification of geographic clustering of benefits and efficient pricing of those benefits. Income equity or impacts on low income is addressed by the adjusting fees by income level or making other forms of adjustments to account for income related effects.
- Other policy measures can be used to address adverse equity effects, however such impacts must be anticipated and planned for.

Legislative and Legal Issues

The diversity of the 50 states in terms of state constitutions, statutes, regulations, and case law precludes an exhaustive review of the legal issues for each state. However, there are a set of issues and questions which can be posed to legal or legislative counsels or states' attorney generals to determine the extent to which new legislation or regulations would be required to implement any of the mechanisms that may seem desirable. A summary of the potential legislative or legal issues associated with each mechanism follows:

- Land Value/Site Value Fee (Recurring Indefinitely): As mentioned, a tax or fee on land values is already incorporated in the traditional property tax. However, in order to assess a new fee on land values exclusively (or to a greater degree than on building values), such a plan must pass the "uniformity" requirement in a state constitution. The uniformity clause typically states that like property must be taxed at the same rates. So the question to be answered is whether "land" and "improvements to land" (buildings) can be considered as different classes of property—and therefore subject to different rates of taxation. In some states, statutes or the state constitution may prohibit the application of different tax rates on land value than on building value. This is currently authorized in 20 Pennsylvania cities.
- SADs (Recurring for a finite period—typically, until a bond is paid off): State-level authorizing legislation is required. In some cases, a majority of landowners within the district (as determined by their number or by the value of their holdings) must consent to the creation of such a district. Some States have developed provisions for the development of special assessments to support transportation funding. The districts go by different names in different states, but specific examples of laws developed by States supporting assessment districts pertain to Virginia and Illinois. The districts in Virginia are called Transportation Improvement Districts (TID), while those in Illinois are called Special Service Areas (SSA). In addition, few states have provisions for rural areas. Many States have laws that establish Transportation Development Districts (TDD) (Kansas, Ohio, Missouri, and New Jersey). These are a form of benefit districts or areas set aside to implement one or more mechanism including impact fees for supporting transportation.

- JD and Transit Connection Fees (One-time/Recurring): Typically, these types of contract arrangements are permitted as part of the property management and disposition powers of a state or municipal government.
- Betterment Levies (One-time): Legislation authorizing and implementing betterment levies have been enacted in Europe and South America (Peterson, 2009).
- Exactions and DIF (One-time): There are two primary legal requirements for the validity of exactions and impact fees:
    - There must be a rational nexus between the new development and the need for additional infrastructure. In other words, impact fees cannot be used to upgrade infrastructure facilities or services for existing residents.
    - Because most new infrastructure will be used by existing taxpayers and new taxpayers alike, the cost of the exaction or the amount of the impact fee must be roughly proportional to the extent to which new infrastructure is used by or benefits new residents or businesses.
    - The nexus tests are subject to federal constitutional law given by:
        i. *Nollan v. California Coastal Commission, 483 U.S. 825 (1987).*
        ii. *Dolan v. City of Tigard, 512 U.S. 374 (1994).*
        iii. *Koontz v. St. Johns River Water Management District, 570 U.S.; 133 Supreme Court 2586 (2013).*

      State-level legislation authorizing the imposition of impact fees or exactions must be enacted. As of 2016, 29 states have enacted authorizing legislation (Mullen, 2016). States authorizing specific legislation for transportation specific impact fees include Oregon (Transportation System Development Charges) (Oregon Laws 223.302).
- TUF (recurring): A TUF is a fee and not a tax. However, unlike DIFs, TUFs are recurring. Like a DIF, the following conditions must hold:
    - Rational nexus between the fee and the transportation operating and maintenance costs that are being funded.
    - Funds raised by this fee must be dedicated to transportation operations and maintenance—and cannot be expended for other public benefits.
- TIF (Recurring increment for a finite period—typically, until a bond is paid off): State-level legislation authorizing Tax Increment Financing (TIF) is required. Many states already have this legislation in place for local transportation. However, very few have TIFs for funding capital costs of state transportation infrastructure. Only Texas authorizes TIF-like laws like for state transportation projects. The Texas law develops a new institutional mechanism called the Transportation Reinvestment Zone (TRZ), which includes only the local government and excludes all other participating districts.
- Lease or Sale of Public Land/Air Rights (One-time or lease): Typically, these types of arrangements are permitted as part of the property management and disposition powers of a state or municipal government. Hong Kong and Canada rely on land leasing extensively. Hong Kong relies on it through Rail+Property method. Domestically, it has been used in many transportation corridors like Interstate-5 Washington State and Massachusetts Turnpike.

Administrative Issues

In addition to the legislative prerequisites, certain administrative issues must be addressed as well. Some issues are common to all value capture mechanisms and some are associated only with particular mechanisms. These arise with establishing: a) the fee b) the geographic area and c) estimate of impact (land value, economic or other measure of impact most suited for the mechanism).

Determination of Impacts

For some land value return mechanisms (SADs, TIFs, Betterment levies) administrators will need to develop an estimate of the likely change in land and or (property) values resulting from the creation or improvement of public infrastructure. The primary complexities associated with such estimates include determining:

- Geographic Extent of Benefits. Typically, benefits are larger close to infrastructure facilities and they diminish with distance (distance decay). This is evidenced from the literature review.
- Timing of Benefits. For mechanisms that are recurring charges or fees, recognizing that in some cases the lion's share of value increase occurs after the project has been announced but before the project goes into service, the "announcement effect" is important. If an infrastructure project is not typical, then the market may not understand the value of that project until after it has come on line and the community has had time to experience the positive and negative externalities associated with it. Additionally, for one-time charges, the process is also not so straightforward since they are typically dependent on the type of development that occurs and/or the trips that may be generated.
- Predicting the Magnitude of Change in Real Estate Value: How much will land values change because of new or improved infrastructure? The answer depends on numerous factors related to both the characteristics of the infrastructure project and the economic environment where a project is added.
    - Project Characteristics:
        i. Are the impacts of the project spread evenly across the community or are they more localized? Only when infrastructure impacts are localized are they likely to create changes in land value.
        ii. Are externalities positive or negative? Many projects have multiple externalities. Some may be positive and some may be negative. The impact and magnitude of these externalities will depend not only on the nature of the project, but also on the nature of the surrounding area. Thus, a freight transfer facility might have a very different impact on land values if surrounding land is industrial than if the surrounding land is residential. This requires an understanding of ways to anticipate or identify externalities.
        iii. How is value created specifically—through access changes, time savings, cost savings, convenience or safety? In other words, what are the key economic means by which the capitalization will occur?
    - Neighborhood and Corridor Characteristics
        i. Is the area surrounding an infrastructure facility or system compatible with that facility?
        ii. Does the infrastructure project create economic or quality-of-life impacts on nearby property owners and users?

iii. Prediction of new development that is likely to occur.

iv. Prediction of future values of land and buildings already in place.

- Data Requirements: Identifying, quantifying and calculating the impacts of these interactive externalities can be accomplished through econometric tools and different types of models. The validity of the results will depend on the skill of the analysts, the validity of their assumptions, and the availability of relevant data to populate the models. In most cases, establishing land values, benefit areas, and LVR type methods relies on good quality appraisal data available as cadastral layers (Geographic Information System [GIS] based files), demographic and transportation network data for land-based mechanisms. These data help to identify the incremental changes.
- Opportunity for Public-Private Partnering: Uncertainties and risks associated with the timing, geographic extent, and magnitude of real estate value increases associated with infrastructure investment may create the preconditions for public-private partnerships. In other words, the public sector may not be able to proceed with an infrastructure project until affected landowners express a willingness to help fund it. Public officials could determine a general transportation corridor with several different alternative alignments. The alignment to be chosen could be based, at least in part, on which landowners coalesce to contribute the most toward its construction. Additionally, public officials could also identify areas needing improvement where there are also other partnering opportunities like those arising from JD, Air Rights, sale or lease of land in the corridors which are to be improved.
- Administrative Requirements Specific to Specific Mechanisms Used in US: In addition, there will be special requirements for each of the value capture mechanisms:
    - Lease or Sale of Public Land or Air Rights: Jurisdictions must employ staff (or hire consultants) who can value public land and air rights.
    - Land Value/Site Value Fee: There are several administrative requirements:
        1. Property assessments must provide separate values for land and improvements. This is already performed in some jurisdictions.
        2. Assessment appeals procedures must allow property owners to appeal the apportionment of their property assessment between its land value and improvement value components, even if the owner does not contest the total amount of the assessment.
- JD/Connection Fees: Similar to the sale or lease of public land and air rights, jurisdictions must employ staff (or hire consultants) who can value public land, air rights and direct connections between private property and adjacent transit stations.
- Betterment Levies: Administrators must be able to estimate the land value increase created by new infrastructure projects. This is more difficult if the estimate is made before the infrastructure goes into service and if there is little or no prior experience with the impact of a particular type of infrastructure improvement on the private real estate market. As mentioned above, difficulties associated with estimating the timing, geographic extent and magnitude of land value increase combined with the burden imposed upon property owners by requiring a one-time lump-sum payment, make this approach very contentious and subject to litigation.
- SADs:
    - The boundaries of the special assessment district must be determined. Typically, the benefits (and land value increments) associated with a particular infrastructure improvement will diminish with distance. Land closest to the new facility will increase in

value the most. At some distance, the value enhancement will be negligible. The special assessment district boundaries should include properties that receive a substantial benefit from the new infrastructure and exclude properties that receive little or no benefit. Consultation with local real estate experts (public assessors, private appraisers, real estate brokers and lenders, etc.) can be helpful in this regard.

- Once the boundaries are determined, the base and rate must be established, as also which land uses will be included/excluded. Will the base consist of land value only (value capture), building value only (value transfer), or both? Once the base is established, then a tax rate can be derived to generate the necessary revenue to pay debt service on bonds that are used to finance the infrastructure project(s) within the district. Typically, most land uses are included unless there are reasons to exclude a specific use.

- Exactions and DIF: Studies must be prepared to demonstrate the degree to which new residential, commercial or industrial development can be expected to generate demand for new infrastructure facilities and services (nexus). Formulas must be developed to ensure that infrastructure payments by private developers (either through negotiated exactions or impact fees) are proportional to the demand generated by the new development (proportionality).
- TIF: A geographic area (similar to a special assessment district) must be identified. Tax revenue streams (as identified in the authorizing legislation) for the TIF area must be identified and benchmarked so that the Tax Increment can be identified going forward. Incremental revenues, once identified, must be deposited into a dedicated account for the funding of infrastructure projects which are identified in the implementing legislation as being necessary for the new private-sector development to occur and succeed.

Political Issues—Generating Project Support

This section discusses the audiences who are important in generating the political will and/or project support. For each value capture method, it will be necessary to generate political support. Doing so requires:

- Identifying and rallying stakeholders and creating partnerships. Key stakeholders typically include:
  - Taxpayers.
    - Property owners.
    - Those trying to earn revenue by investing in private goods and services.
    - Those trying to earn revenue via publicly created land values.
  - Elected officials.
  - Implementing agencies.
  - Affordable housing advocates, unions and labor advocates, and environmentalists.
- Defining the pros and cons of the method for each key stakeholder group. Effective communication is very important. Different stakeholders often use language differently, so the same statement might mean different things to different groups. The communications task is facilitated by the inherent comprehensibility, fairness and transparency of method adopted. In other words, those who benefit from public infrastructure should help pay for that infrastructure in proportion to the benefits that they receive.

- Coordinating with local agencies and intergovernmental roles. State transportation agencies can help educate and inform local governments about the importance of LVR. In some cases, they may wish to condition state aid on local implementation of value capture techniques. Many state governments already work with multiple parties as part of their current processes and could extend that to local governments and private landowners for negotiating LVR approaches to infrastructure funding.
- Coordinating intergovernmental policy (federal, state, regional, MPO, and local). The federal government has typically viewed local transportation funding as outside its domain, except for federal grants, loans, or loan guarantees (e.g., Transportation Infrastructure Finance and Innovation Act (TIFIA)). The FHWA requires the federal government to determine if the required match or funding is provided from state or local sources.

This framework notes that how we pay for infrastructure is as important as how much we pay. The choice of infrastructure funding methods can enhance or reduce the stakeholder and political support and therefore the successful implementation of projects. How we pay can increase the political support if the payment is transparent and equitable, showing that property owning beneficiaries are paying for the benefits they receive. The federal government, for example, could condition grants on state and local evaluation of funding methods and on progress in implementing LVR type methods. The federal government could also educate state and local governments on negotiating with private landowners for LVR approaches to infrastructure funding. Finally, the federal government could adjust the income tax code so that only the land value portion of state and local property taxes would be deductible. No jurisdiction would want to have a property tax that was not fully deductible, so this would be a powerful incentive to move state and local governments toward converting their property tax into a land value "access" fee.

Transportation Planning Considerations

This section discusses if it is feasible to consider land value return methods as part of transportation planning and, if so, when and how. It also presents example regions that have attempted to do so.

State DOTs and MPOs use financial planning to take a long-range look at how transportation investments are funded and at the possible sources of funds. State DOTs, MPOs, and public transportation operators must consider funding needs over the 20-year period of the transportation plan and the four-year period of the Transportation Improvement Program (TIP) and Statewide Transportation Improvement Program (STIP). In the long-range statewide transportation plan and the long-range metropolitan transportation plan (MTP), MPOs must, and state DOTs may, develop a financial plan that identifies funding sources for needed investments. The financial plan must also demonstrate a reasonably reliable means to maintain and operate the existing and future federally and state-funded transportation system, as well as recommended new or improved facilities and services. Financial planning establishes the fairness and reliability of the MTP for the 20-year horizon. This includes information on how the MPO expects to fund the projects included in the plan and anticipated revenues from Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA), state government, regional or local sources, the private sector, and user charges. Financial programming involves identifying available or expected funds and scheduling specific projects listed in the STIP, metropolitan TIP, and MTP.

For planning purposes, it would be easier to accept a new revenue source in the out-years (years 15–20) of the MTP since the region would have many years to implement the new revenue source and several MTP updates to revisit their progress. FHWA provides several examples of available funding for financial planning. One example pertains indirectly to LVRR type methods. A new tax or fee for transportation purposes requiring local and/or state legislation and/or support from the governor is reasonable if there is clear evidence of sufficient governmental and public support to enact the new fee or

tax and a strategy exists for planning studies and securing approval within the time period for implementation.

In the case of highways, states are the primary decision makers in selecting transportation projects for funding. Once funds are assigned (largely by formula), the states distribute them among projects within various program categories as they see fit (Levinson and Istrate 2011). The STIP includes all of the projects planned for implementation and the funds expected from FHWA and FTA, including all regionally significant projects, as defined by regulation, regardless of funding source. The STIP also incorporates the TIP for each MPO in the state so that all projects included in the first four years of a TIP are part of the STIP. The STIP and the TIP must be financially controlled.

Agencies seeking federal funds usually follow these guidelines to include the project in the TIP:

- The TIP must be consistent with the relevant MTP.
- The STIP and TIP must identify which funding sources—federal, state, local, or others—will be used for each project and show that there will be sufficient funds to advance a project each year.

In air quality non-attainment or maintenance areas, projects included in the first two years of a TIP must have funds—federal and non-federal matching funds—available or committed to the projects as defined in regulation. In areas that are in attainment of air quality standards, funding to support projects listed in the STIP and TIP must be reasonably expected to be available. Most projects involve spending funds over a multi-year period, which will be indicated in the STIP and TIP. If funding sources like LVR and broader value capture methods are to be used in projects or corridors, they must be in place through regulation with valid revenue projections before a project is approved for construction.

A project, or an identified phase of a project, will be included in a STIP only if it is reasonable to expect that full funding will be available to complete the entire project within the expected time frame for project implementation.

These federal and state requirements are especially important when considering LVR, LVR-like and broader value capture methods as an innovative funding tool. These methods must be adopted and in place with a valid revenue forecast before the project can be included in the four-year TIP. Therefore, depending on the scale of the project, planning and programming for use of LVR should begin at least five years before the federally funded transportation project is to be let.

Air rights, exactions, impact fees, and transportation utility fees may be problematic for planning of federally funded projects in terms of financial control. Planners can demonstrate the reasonableness of them after construction begins based on the federal criteria noted above. The expectation of future funding from the sources can then be used for future planning in a corridor or region. The timing of land value tax or fee imposition relative to the stage in the project development cycle (as developed in a University of Minnesota study (Lari et al. 2009) is important when considering it in the planning context. Table G3 identifies potential times to consider new funding sources like LVR as part of long-range plans.

Examples of MPOs considering LVR type methods in long-range planning include the Chicago Metropolitan Planning Area (CMAP) and Southern California Association of Governments (SCAG). CMAP began considering such methods consistent with Illinois provisions for the development of special service areas (assessment districts) on a corridor basis as part of its Goto2040 long-range plan. CMAP also recommended a more detailed consideration of use of methods like SADs and TIFs as part of its new long-range plan (CMAP, 2015). SCAG also includes some methods like assessment districts and tax increment finance as part of its long-range plan (SCAG, 2016).

From a planning perspective, the findings from the land value impacts review are important.

- Not all projects are identical with respect to their impacts so the same method cannot be considered for all projects. In addition, more than one method can be used for one project (as part of an overall strategy) based on the context including the possibilities for joint development.
- Agencies can certainly play a proactive role in recognizing how to create value and to examine projects that maximize the opportunities to deliver transportation benefits and present opportunities for land value return.

Both of these findings point to the need for some form of screening and evaluation for possible methods.

Land Use Planning Considerations

Land value is determined by a number of factors, including (1) public investments in infrastructure and social services; (2) population growth and economic development; (3) private investments that increase land value; and (4) the original productivity of the land itself and finally (5) changes in land use regulations; (Hong and Brubaker 2010). Hence, while it is a much-debated area, land use planning and regulations play an important role in LVR and LVR-like methods. Several methods like developer agreements, incentive zoning, and exactions are used by local governments. Used judiciously, they can ensure the success of LVR type methods.

Table G3. Timing and Location of Value Capture Methods.

Methods	Before Project	After Project	Location
Land value fee	√	√	Area wide.
Special assessment fees	√	√	Defined area.
Tax increment finance	√	√	Defined area.
Joint development/air rights	√	√	At or near the site. For instance, on or adjacent to state DOT rights of way.
Exactions	√		On or off the site.
Development impact fees	√	√	New developments; On or off the site.
Transportation utility fees	√	√	Area wide or within a defined district.
Miscellaneous other (sales taxes, payroll taxes)	√	√	Area wide.

(Source: Adapted from Lari et al. [2009])

Chapter G4. Proposed Case Studies for Consideration in the Guidebook

This chapter presents the criteria and cases used in the Guidebook.

Case Study Selection Process

The research team conducted case studies to demonstrate various elements associated with land value return and recycling methods and to develop stories for how different types of mechanisms have been adopted. One challenge in developing case examples is selecting the cases, given that many different LVR methods need to be included. Each method is associated with its own characteristics and implementation issues, as discussed in Chapter G2; thus, a formal process was set up to identify and select case examples for potential consideration in the Guidebook. This section details the process of identifying potential case examples. The search focused on the use of land value return methods (or land value return-like methods) for either funding a specific transportation project or transportation funding in general. Of the methods discussed, impact fees, land value capture (split rate taxes) are mainly general funding sources or regional funding approaches; assessment districts and increment finance are project specific; and joint development, air rights, exactions, land leases, and sales are typically site specific (i.e., they occur at specific sites adjacent to the transportation corridor or transit facility).

The original research proposed the use of several case studies both to describe specific concepts as this guidebook has included and also to walk through various methodological aspects like the establishment of benefit areas and revenue feasibility. Early on in the research, the panel felt that as a guidebook for policy makers, the emphasis on the former was critical. Hence, further screening of cases studies was not undertaken in this research. Another point to be made is that this case study list is by no means comprehensive. Each case is chosen to depict one or more aspects that are important for policy makers to note.

Criteria and Approach Adopted for Case Development

The selection of cases was driven by the following criteria:

1. Ability to leverage information from prior documents like Synthesis 459, and recent research reports.
2. Ability to compile project narratives and project related information.
3. Ability for the case to highlight key elements to the agencies like State DOT agencies and planning organizations for whom the guidebook is intended for including barriers in implementation, if any.
4. Inclusion of examples where the method adopted was not successful.

The second criteria set comprises of several sub-criteria mentioned below:

- Project or Project Name.
- Project specific or more broadly established in an area.
- Location—City or County, State.
- Type of method or description of its hybrid nature of two or more methods.
- Project type—primary mode(s) and specifics such as new transit line or station; widening, new lane, new intersections, etc.
- Informational resources.
    - Photo, if appropriate and available.
    - Website links and bibliographic references to where additional details can be found (as many as makes sense).

- Key contacts who may be able to verify information or be available to discuss.

The third criteria set is informed by the different issues covered in the report and the ability of the cases to inform state and local agencies of the nuances of the method itself. These vary across and case examples and include:

- Extent of use in a state.
- Lessons learned, if any.
- Applicability in specific highway contexts (specifically for some methods which are more frequently seen in the context of transit like joint development).
- Revenue generation.
- Partnerships formed.
- Stakeholder engagement approaches.
- Challenges in establishing, implementation and other legal challenges.
- District formation or details on geographic features of method.

Table G4 presents the range of different cases drawn for consideration in the Guidebook. Table G4 also provides the specific issues examined in more detail in each case.

Table G4. Matrix of Selected Cases by Location, Method, and Topics for Discussion in the Guidebook

#	Case Name	Location	Project Type	Suitability for Guidebook	Specific Elements to be Highlighted
1	Land Value Tax in Pennsylvania jurisdictions	Pittsburgh, and or Harrisburg and/or other localities, PA Duquesne—outside of Pittsburgh	Multiple, primarily local but include very few cases of state projects[1] Specifics not available.	• Methods • Benefits and Drawbacks	• General explanation • Lessons learned and drawbacks from Pittsburgh • Use across other jurisdictions in Pennsylvania
2	Joint Development Fees/Connection Fees—Massachusetts Turnpike	Massachusetts	Highway	• Methods	• General explanation • How does it work in the context of a highway?
3	Joint Development Fees/Connection Fees—WMATA	Washington, DC	Transit-related development	• Revenue generating ability • Benefits and Drawbacks (flexibility in one JD program)	• History of substantial revenue from source & off-loading of costs • Program allows ground lease, sale, air rights, and connection fees
4	Betterment Levy	Bogota, Colombia	Both highway and transit	• Methods • Benefits and Drawbacks • Revenue generating ability	• General explanation • Methods used • Revenues
5	Special Assessment District—Route 28[2]	Fairfax and Loudoun Counties, VA	State Highway widening and interchanges	• Methods • Revenue generating ability	• General explanation • Coordination with State and local funding sources • SAD are definition • Issues and factors in defining SAD. • Commercial and industrial properties only
6	Special Assessment District—Rural Improvement District	Montana and/or North Dakota	Not available	• Revenue generating ability	• Rural success • Rural viability of revenue generation • SAD are definition • Issues and factors in defining SAD

[1] Email conversations with Philadelphia Mayor Tom Murphy.
[2] Discussions with Laura Farmer, Virginia Department of Transportation.

#	Case Name	Location	Project Type	Suitability for Guidebook	Specific Elements to be Highlighted
7	Special Assessment District—Elgin O'Hare Expressway & SR 53/120 Illinois Tollway[3]	Chicago, IL	State highway corridor improvements	• Revenue generating ability • Implementation—stakeholder support and/or admin/institutional requirements	• Understand this is in feasibility assessment phases • Approach to stakeholder support and challenges in establishing administratively/institutionally • SAD are definition • Issues and factors in defining SAD
8	Special Assessment District—Dulles Metrorail	Fairfax and Loudoun Counties, VA	New transit line parallel to a tollway	• Revenue generating ability • Implementation—institutional requirements and stakeholder support. • Involvement—County level	• Need to focus on the TID (SAD) which is the land value return method used by counties for their share • MWAA control and linkage to toll road • How was area of SAD defined? What were the issues in establishing the geographic coverage and key factors? • Multijurisdictional—Two county partnership • State involvement, Federal Transit Administration (FTA) grant—workings of county TID with these other entities etc. • Legal/institutional challenges
9	Sale or Lease of Publicly Owned Land or Air Rights—Seattle urban park & office building on bridge over interstate and/or Columbus Union State Place bridge over I-670 that can support retail space near Massachusetts Turnpike	Seattle, WA, and/or Columbus, OH MA	Highway overpass land	• Methods • Legal • Revenue generating ability	• General explanation • Complex legal issues of air rights generally and with overpass over Interstate • Viability of revenue generation—infill development
10	Development Impact Fees—Oregon or Washington State[4]	Oregon or Washington State locality that implemented under their	Multimodal (projects from city comprehensive plans)—local projects	• Methods • Ability to share the benefits • Legal	• General explanation • State-local partnering by which locals implement DIFs • Rational nexus requirements in state programs that locals follow and how demonstrated

[3] Discussion with Elizabeth Schuh, Chicago Metropolitan Area Planning.
[4] Discussion with Barbara Fraser, Panel member NCHRP 19-13 and Oregon Department of Transportation.

#	Case Name	Location	Project Type	Suitability for Guidebook	Specific Elements to be Highlighted
		state programs			
11	Development Impact Fees—NJ	4 counties tried & 2 have operational trans. dev. districts	Highway Interstate 295	• Ability to share the benefits • Benefits and Drawbacks	• Barriers in implementation
12	Exactions or Proffers—Virginia proffer[5]	Virginia	Not available	• Methods	• General explanation
13	Transportation Utility Fees—Oregon locality[6]	Oregon local—maybe rural if possible	Operations and maintenance	• Methods • Revenue generating ability	• General explanation • How much revenue is generated? What is basis for revenue? • Rational nexus requirements
14	Transportation Utility Fees—Fort Collins, Colorado, or Florida	CO or FL	TBD or NA	• Legal	• How legal challenges overturned these in certain places
15	Tax Increment Financing-El Paso, TX (This is not a TIF, but a TIF-like mechanism for transportation)[7]	El Paso, TX	Interchange improvements on an Interstate corridor	• Revenue generating ability • Legal	• Revenue relative to projections • Portion of project costs covered by TIF district • Area of benefit definition and issues in establishing the geographic coverage and describe the factors bearing on this case • Did development occur as projected • State-local partnering • Leveraging the revenues

[5] Discussion with Audrey Moruza, Virginia Department of Transportation and Right of Way Office, Virginia Department of Transportation.
[6] Discussion with Barbara Fraser, Panel member NCHRP 19-13 and Oregon Department of Transportation.
[7] Discussion with Camino Real Regional Mobility Authority, TX.

#	Case Name	Location	Project Type	Suitability for Guidebook	Specific Elements to be Highlighted
16	Tax Increment Financing)—Denver Union Station and Chicago Red line	Denver Chicago Red line	Transit station Transit line	• Methods • Revenue generating ability	• General explanation • Anticipated revenue in an infill situation • How was area of SAD defined? What were the issues in establishing the geographic coverage and describe the factors? • Partnering
17	Betterment levy and other methods—London Crossrail	London, UK	New transit line	• **17**	• Betterment levy and other methods
18	Betterment levy and other methods—London Crossrail	London, UK	New transit line	• Ability to share the economic benefits/proximity pricing	• Public-private partnering
19	Reno Rail Transportation Access Corridor (RETRAC)	Reno, NV	Rail/highway at-grade crossings eliminated	• Revenue generating ability	• Public-private partnering—freight example of increasing amenity value via safety improvements • Financing/Funding linkage—Repayment of credit assistance
20	Transportation Utility Fee/Payroll Tax—Versement Transport	France municipalities	Public transportation	• Revenue generating ability	• Public-private partnerships—engaging corporations in funding public transportation
21	Warwick Station Development District (Tax increment finance)	Rhode Island	Transit	• Implementation	• Lessons learned
22	Joint development—Hong Rail+Property	Regional approach, Hong Kong	Public transportation	• Revenue generating ability	• Public-private partnerships—engage developers and governments in cost and profit sharing • Level of potential revenue-generating profit

#	Case Name	Location	Project Type	Suitability for Guidebook	Specific Elements to be Highlighted
23	MPOs or States considering value sharing in long-range plans[8]	Chicago Metropolitan Planning Area and Southern California Association of Governments	Long-range plans	• Transportation planning	• Integration of such methods into the planning process?
24	Special Assessment District—NoMa-Gallaudet Metrorail Station, Washington Area Metropolitan Transit Authority (WMATA) and Potomac Yard Metrorail Station, WMATA	Washington, DC; Alexandria, VA	Transit station	• Methods • Revenue generating ability	• Public private partnering • Combination of revenue streams
25	I-395 Capital Crossing Air Rights	Washington, D.C.	Deck over I-395	• Methods • Revenue generating ability • Partnerships	• Public private partnering • Complexity involved in decking

[8] Discussion with Elizabeth Schuh, Chicago Metropolitan Area Planning.

Final List of Selected Case Examples

The following case examples were used in the Guidebook and are summarized in Appendix B. Some case examples were not used because the funding methods were considered not to be value return or because of inadequate information. Hence, they are not reproduced in this section.

Land Value Return and Recycling Methods

- Land Value Tax or Split Rate Tax
    - Pittsburgh Metropolitan Area Localities (Pittsburgh, McKeesport, Duquesne, and Clairton, Pennsylvania)
- Betterment Levy
    - Bogotá, Colombia
    - Crossrail (London, United Kingdom)
- Special Assessment Districts
    - State Route 28 (Fairfax and Loudoun Counties, Virginia)
    - Elgin O'Hare Western Access (Chicago Metropolitan Area, Illinois) (not implemented)
    - Dulles Silver Line Metrorail Extension Washington Area Metropolitan Transit Authority (WMATA) (Fairfax and Loudoun Counties, Virginia)
    - State of Michigan Locality Authorization (several examples)
    - Crossrail (London, United Kingdom) (presented under Betterment Levy)
    - Reno Rail Transportation Access Corridor (ReTRAC) (Reno, Nevada)
    - NoMa-Gallaudet Metrorail Station, Washington Area Metropolitan Transit Authority (WMATA) (Washington, DC)
    - Potomac Yard Metrorail Station, Washington Area Metropolitan Transit Authority (WMATA) (Alexandria, Virginia)
- Sale or Lease of Public Land or Air Rights, including Joint Development
    - Washington Bridge Apartments (New York City, New York)
    - Copley Place Development (Boston, Massachusetts)
    - Memorandum of Understanding to Facilitate Massachusetts Turnpike Air Rights Development (Boston, Massachusetts)
    - Various Joint Development Projects, Washington Area Metropolitan Transit Authority (WMATA) (Washington, DC)
    - High Street Cap Development (Columbus, Ohio)
    - Rail System Land Leasing Model (Hong Kong)
    - Crossrail (London, United Kingdom) (also presented under Betterment Levy)
    - I-395 Capital Crossing Air Rights Project, Washington, DC

Land Value Return-Like Methods

- Transportation Utility Fee
    - Pavement Maintenance Utility Fee (Oregon City, Oregon)
- Tax Increment Financing
    - Transportation Reinvestment Zones (El Paso, Texas)
    - Denver Union Station (Denver, Colorado)
    - Illinois Route 53/120 (Lake County, Illinois) (project still in planning stages)
- Development Impact Fee
    - Portland, Oregon
    - Potomac Yard Metrorail Station, Washington Area Metropolitan Transit Authority (WMATA) (Alexandria, Virginia) (presented under Special Assessment District)
- Exaction or Proffer
    - Virginia localities (Loudoun County and City of Chesapeake, Virginia)
    - Crossrail (London, United Kingdom) (also presented under Betterment Levy)

Land Value Return Integration with Transportation and/or Land Use Planning

- Chicago Metropolitan Agency for Planning (CMAP)
- Southern California Association of Governments (SCAG)

References

Al-Mosaind, M., K. Dueker, and J. Strathman. 1993. Light Rail Transit Stations and Property Values. *Transportation Research Record 1400*: 90–94.

Alonso, W. 1964. Location and Land Use: Toward a General Theory of Land Rent. Harvard University Press, Cambridge.

American Planning Association. n.d. Policy Guide on Smart Growth. Accessed 2016. https://www.planning.org/policy/guides/adopted/smartgrowth.htm.

Armstrong, R. 1994. Impacts of commuter rail service as reflected in single-family Residential Property Values. *Transportation Research Record 1466*: 88–98.

Armstrong, R. J., and D. A. Rodríguez. 2006. An evaluation of the accessibility benefits of commuter rail in eastern Massachusetts using Spatial Hedonic Price Functions. *Transportation* 33(1), 21–43.

Batt, W. 2001. Value Capture as a Policy Tool in Transportation Economics: An Exploration in Public Finance in the Tradition of Henry George. *The American Journal of Economics and Sociology*, Vol. 60, No. 1, pp. 195–228.

Baxtarr Consulting Group. Final Report Economic and Fiscal Impact: Interchange—I-71/US36/SR37. Prepared for Delaware County Commissioners. 2011. Accessed 2016. https://www.dot.state.oh.us/Divisions/InnovativeDelivery/DEL71%203637%20Interchange/I71%20US36%20Economic%20Impact%20Study%20BaxStarr1%20Final%205-23-11.pdf.

Bechtel. n.d. Crossrail. Accessed 2016. http://www.bechtel.com/projects/crossrail-london/.

Bhatta, S. and M. Drennan. 2003. The Economic Benefits of Public

Investment in Transportation. A Review of Recent Literature. *Journal of Planning Education and Research*, 22, 228-296.

Bloomberg. 2015. US Should Adopt a Land Tax to Combat Inequality. Accessed 2016. http://www.iol.co.za/business/opinion/columnists/us-should-adopt-a-land-tax-to-combat-inequality-1827238.

Boarnet, M., and S. Chalermpong. 2001. New Highways, House Prices, and Urban Development: A Case Study of Toll Roads in Orange County, CA. *Housing Policy Debate*, Vol. 12, No. 3.

Boarnet, M. G., and A. F. Haughwout. 2000. *Do Highways Matter? Evidence and Policy Implications of Highways Influence on Metropolitan Development*. The Brookings Institution Center on Urban and Metropolitan Policy.

Boyce, D. E., B. Allen, R. R. Mudge, P. B. Slater, and A. M. Isserman. 1972. Impact of Rapid Transit on Suburban Residential Property Values and Land Development. U.S. Department of Transportation, 367.

Brueckner, J. 2000. Urban Sprawl: Diagnosis and Remedies. *International Regional Science Review* 23, 16–171.

Brueckner, J. 2001. Urban Sprawl. Lessons Learned from Urban Economics. Brookings Wharton Papers on Urban Affairs: 65–96.

Burchell, R., G. Lowenstein, W. Dolphin, C. Galley, A. Downs, S. Seskin, K. Still, and T. Moore. 2002. Costs of Sprawl—2000. Transit Cooperative Research Program, Federal Transportation Administration. Accessed 2016. http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_74-a.pdf

Cambridge Systematics, EDR Group, Halcrow Inc., Decision Tek, and Boston Strategies International. 2011. *NCFRP Report 12: Framework and Tools for Estimating Benefits of Specific Freight Network*

Investments. Project NCFRP-05, ISSN 1947-5659, ISBN 978-0-309-21356-1, Washington, DC. Accessed 2016. http://onlinepubs.trb.org/onlinepubs/ncfrp/ncfrp_rpt_012.pdf.

Campbell, J. 2013. ULI Research Round Up. The Impact of Transit on Property Values. Accessed August 2016. http://www.uli.org/infrastructure-initiative/uli-research-roundup-the-impact-of-transit-on-property-values.

Carey, J. 2001. Impact of Highways on Property Values: Case Study of the Superstition Freeway Corridor. Final Report 516. Arizona Department of Transportation. Accessed 2016. http://ntl.bts.gov/lib/24000/24800/24842/AZ516.pdf.

Carter, C., Z. Farkas, P. Inkoom, and P. James. 2003. Effects of Thoroughfares on Residential and Commercial Values in Tow Cities. State Highway Administration. MD-03-SP208B4L. Morgan State University.

Cervero, R., and C. D. Kang. 2011. Bus rapid transit impacts on land uses and land values in Seoul, Korea. *Transport Policy* 18(1): 102–116.

Cervero, R., and J. Murakami. 2008. Rail+Property Development: A Sustainable Model of Transit Finance and Urbanism. Accessed 2016. http://www.its.berkeley.edu/sites/default/files/publications/UCB/2008/VWP/UCB-ITS-VWP-2008-5.pdf.

Cheshire, P., and S. Sheppard. 1995. On the Price of Land and the Value of Amenities. *Economica* 62(246), 247–267.

Chicago Metropolitan Planning Area (CMPA). 2015. Next Long Range Plan: Transportation System Funding Concepts.

Clancy, G. 2012. Warwick Station Development Master Plan. Accessed 2016. http://www.citycentrewarwick.com/sites/default/files/Master%20Plan.pdf.

Clinton-Gore Administration. 2000. Building Livable Communities.

Concas, S. 2013. Accessibility and Hose Price Resilience: Evidence from Limited Access Roadways in Florida. *Transportation Research Record,* 2347.

Crossrail Learning Legacy and Risk Management. Accessed 2016. http://learninglegacy.crossrail.co.uk/learning-legacy-themes/project-and-programme-management/programme-and-control-reporting/risk-management/.

Crossrail Ltd. n.d. Crossrail Funding. Accessed 2016. http://www.crossrail.co.uk/about-us/funding.

Crossrail Ltd. 2005. Cross Environmental Statement. Accessed 2016. http://74f85f59f39b887b696f-ab656259048fb93837ecc0ecbcf0c557.r23.cf3.rackcdn.com/assets/library/document/n/original/non-technical-summary-.pdf.

DC Code. 2001. Ed. 9-401.04 through 9-421.13.

Diaz, R. 1999. Impacts of Rail Transit on Property Values. Accessed 2016. http://reconnectingamerica.org/assets/Uploads/bestpractice083.pdf.

DiMasi, J. 1987. The Effects of Site Value Taxation in an Urban Area: A General Equilibrium Computational Approach. *National Tax Journal*, Vol. 40, pp. 577–590.

Dougherty, J. 1995. Private Developer to Build $20 Million Va. Metro Station: Public Private Partnership Lauded. *Passenger Transport, American Public Transportation Association*, Vol. 53, No. 47.

Dulles Corridor Metrorail Project. n.d. Virginia Department of Rail and Public Transportation and Dulles Metro Environmental Assessment. Accessed July 2016. http://www.dullesmetro.com/about-dulles-rail/environment/.

Duncan, M. 2008. Comparing rail transit capitalization benefits for single-family and condominium units in San Diego, CA. *Transportation Research Record, 2067*: 120–130.

Economics Center. 2012. Economic Impact of the Proposed I-71 Interchange at the Martin Luther King Drive. Prepared for the Uptown Consortium and Cincinnati Business Committee. Accessed 2016. http://city-egov.cincinnati-oh.gov/Webtop/ws/fyi/public/fyi_docs/Blob/3010.pdf?m=2&w=doc_no%3D%272554%27.

ECONorthwest. 2010. SR-35 Hood River Bridge: Economic Effects. Report for The Southwest Washington Regional Transportation Council.

EDR Group and Compass Transportation and Technology Inc. 2016. Economic Impact Case Study Toolkit for Transit. Transit Cooperative Research Report.

EDR Group, ICF International, Wilbur Smith Associates, Cambridge Systematics, and Texas A&M Transportation Institute. 2012. Interactions between Transportation Capacity, Economic Systems, and Land Use. Transportation Research Board.

Fernald, J. 1999. Roads to Prosperity? Assessing the Link between Public capital and Productivity. *The American Economic Review,* Vol. 89, No. 3, pp. 619–638.

FHWA. n.d. Federal Aid Matching Strategies. Accessed 2016. http://www.fhwa.dot.gov/ipd/finance/tools_programs/federal_aid/matching_strategies/.

Fitzroy, S., G. Weisbrod, and N. Stein. 2014. TPICS TIGER and US Experience: A Focus on Case-Based Ex-post Economic Impact Assessment. International Transport Forum. Discussion Paper 2014-11, OECD.

Franklin, J., and P. Waddell. 2003. A Hedonic Regression of Home Prices in King County, Washington Using Activity-Specific Accessibility Measures. Transportation Research Board Annual Meeting.

Gamble, H., O. Sauerlender, and J. Langley. 1974. Adverse and beneficial effects of highways on residential property values. *Transportation Research Record* 508: 37–48.

Garrett, T. 2004. *Light Rail in America: Policy Issues and Prospects for Economic Development*. Unpublished Manuscript, Federal Reserve Bank of St. Louis, Research Department.

Gruen, A. 1997. The Effect of CTA and METRA Stations on Residential Property Values. Regional Transportation Authority.

GVA Grimley. 2004. Developing a Methodology to Capture Land Value Uplift around Transport Facilities. Scottish Executive. 2004.

Hall, P., and S. Marshall. 2000. Report on Transport and Land Use/Development for the Independent Transport Commission. London, University College London.

Handy, S. 2002. Smart Growth and The Transportation Land Use Connection: What Does the Research Tell Us? Accessed 2016. http://www.reconnectingamerica.org/assets/Uploads/HandyPaper2.pdf.

Hong, Y.-H., and D. Brubaker. 2010. Integrating the proposed property tax with the public leasehold system. In China's local public finance in transition, ed. J. Y. Man and Y.-H. Hong. Cambridge, MA: Lincoln Institute of Land Policy.

Huang, W. 1994. *The Effects of Transportation Infrastructure on Nearby Property Values: A Review of the Literature*. Institute of Urban and Regional Development: Berkeley, CA.

Iacono, M., and D. Levinson. 2010. Location, Regional Accessibility and Price Effects: Evidence from Twin Cities Home Sales. Accessed 2016. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1736213.

Iacono, M., D. Levinson, Z. J. Zhao, and A. Lari. 2009. Value capture for transportation finance: Report to the Minnesota Legislature. Report No. CTS 09-18S. www.cts.umn.edu/Research/featured/valuecapture/.

Illinois Tollway. 2015. Illinois Route 53/120. Accessed July 2016. http://www.equipmentworld.com/illinois-tollway-approves-funding-up-to-993-million-for-route-53120-project/

Innovative DOT. Focus Area 7. Integration Land Use and Transportation Decision Making. Accessed 2016. https://www.smartgrowthamerica.org/app/legacy/documents/the-innovative-dot-3_focus-area-7.pdf.

Islam, S. 2010. An Examination of the Differential Impact of Highway Capital Investment on Economically Disparate Appalachian Counties in the USA. *Transportation Planning and Technology*, Vol. 33, No. 5, pp. 453–464.

Kawamura, K., and S. Mahajan. 2005. Hedonic Analysis of Impacts of Traffic Volumes on Property Values. *Transportation Research Record: Journal of the Transportation Research Board, No. 1924,* Transportation Research Board of the National Academies, Washington, DC, pp. 69–75.

Kushner, J. A. 2010. Affordable Housing as Infrastructure in the Time of Global Warming. *The Urban Lawyer*, Vol. 42, No. 4, p. 207.

Kusmin, Lorin D., John M. Redman, and David W. Sears. 1996. Factors Associated with Rural Economic Growth: Lessons from the 1980s. TB-1850, U.S. Department. Of Agriculture. Economic Research Services.

Landis, J., S. Guhathakurta, W. Huang, M. Zhang, and B. Fukuji. 1995. *Rail Transit Investments, Real Estate Values, and Land Use Change: A Comparative Analysis of Five California Rail Transit Systems*. Institute of Urban and Regional Development. University of California, Berkeley.

Langley, J. 2015. Value Capture Roadmap. Accessed 2016. http://www.aecom.com/au/wp-content/uploads/2015/12/Value-Capture-Roadmap-2015.pdf.

Lari, A., D. Levinson, Z. Zhao, M. Iacono, S. Autlman, K. Das, K. Larson, and M. Scharenbroich. 2009. Value Capture for Transportation Finance. Center for Transportation Studies. University of Minnesota. CTS Project: 2009016-17-18.

Leinberger, C. 2010. Here Comes the Neighborhood. *The Atlantic*, June 2010. Accessed 2016. http://www.theatlantic.com/magazine/archive/2010/06/here-comes-the-neighborhood/308093/.

Levinson, D. M., and Istrate, E. 2011. Access for Value: Financing Transportation through Land Value Capture. Brookings Institution.

Levkovic, O., J. Rouwendal, and R. Marwijk. 2016. The Effects of Highway Development on Housing Prices. *Transportation* 43: 379–405.

Li, W., and D. Saphores. 2012. Assessing Impacts of Freeway Truck Traffic on Residential Property Values: Southern California Case Study. *Transportation Research Record, 2289*: 48–56.

Litman, T. 2013. Understanding Smart Growth Savings: What We Know About Public Infrastructure and Service Cost Savings, And How They Are Misrepresented by Critics. Victoria Transport Institute. Accessed 2016. http://www.vtpi.org/sg_save.pdf.

Lynch, T. 2007. Twin Counties Study Update: The Impact of Highway Investments on Economic Growth in the Appalachian Region, 1969–2000: An Update and Extension of the Twin County Study. Chapter 3,

pp. 28–44, in Economic Development Research Group Inc., and Massachusetts Institute of Technology Department of Urban Studies and Planning, *Sources of Regional Growth in Non-Metro Appalachia, Vol. 3: Statistical Studies of Spatial Economic Relationships*, Prepared for the Appalachian Regional Commission.

Mamunaes, T., and I. Nadiri. 2006. Production, Consumption and Rates of Return to Public Infrastructure. New York University and National Bureau of Economic Research Working Paper. Accessed 2016. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.352.8782&rep=rep1&type=pdf.

Mathur, S., and A. Smith. 2014. A Decision Support Framework for Using Value Capture to Fund Public Transit. MTI-11-14. Accessed 2015. http://transweb.sjsu.edu/PDFs/research/1004-decision-support-framework-value-capture-public-transit-funding.pdf.

McNally, A. 2014. Intermodal Logistics Centers and Their Impact on Transportation Corridor Industrial Property Value. Thesis. University of Illinois, Chicago.

Mikelbank, B. A. 2004. Spatial analysis of the relationship between housing values and investments in transportation infrastructure. *The Annals of Regional Science*, 38: 705–726.

Mikelbank, B. A. 2005. Be Careful of What You Wish For: The House Price Impact of Investments in Transport Infrastructure. Sage Publications. Accessed 2016. http://uar.sagepub.com/content/41/1/20.full.pdf.

Missouri Department of Transportation. 2004. "A Guide to Financing Successful Partnerships with Missouri." Department of Transportation. Accessed 2013. www.modot.org/services/community/documents/programguide.pdf.

Missouri Department of Transportation. 2009. Frequently Asked Questions Transportation Development Districts (Applies to "On-State-System" Projects"). Accessed 2016. http://www.modot.org/partnershipdevelopment/documents/TDDfaq.pdf.

Missouri Revised Statutes. Transportation Districts. Accessed 2016. http://www.moga.mo.gov/mostatutes/stathtml/23800002751.html

Mohring, H. 1961. Land Values and the Management of Highway Benefits. *Journal of Political Economy*, Vol. 69 (June): 236–269.

Moon, H., Jr. 1988. Interstate Highway Interchanges as Instigators of Nonmetropolitan Development, *Transportation Research Record,* 1125, pp. 8-14.

Mullen, C. 2016. State Impact Fee Enabling Acts. Accessed 2016. http://growthandinfrastructure.org/.

Nadiri, M., and T. Mamunaes. 1996. Contribution of Highway Capital to Industry and National Productivity Growth," Report Prepared for Apogee Research, Inc., for the Federal Highway Administration Office of Policy Development, Work Order Number BAT-94-008.

National Governors Association. 2008. Innovative State Transportation Funding and Financing: Policy Options for States. NGA Center for Best Practices.

Oregon Laws. System Development Charges. Accessed 2016. http://www.oregonlaws.org/ors/223.302.

Palmquist, R. 1980. Impact of Highway Improvements on Property Values in Washington. Washington State Transportation Commission.

Palmquist, R. 1982. Impact of highway improvements on property values in Washington State. *Transportation Research Record* 887: 22–29.

Payne-Maxie Consultant and Blayney-Dyett Associates. 1980. The Land Use and Development Impacts of Beltways. Report DOT, U.S. Department of Transportation, Washington, DC.

Pennsylvania Economy League and Economic Development Research Group. The Value of Connections. The Economic Impact of the Proposed Pennsylvania Turnpike and Interstate 95 Interchange. 2000. Accessed 2016. http://economyleague.org/uploads/files/584281456430254054-the-value-of-connections-full-report.pdf.

Perk, V., and M. Catalana. 2009. *Land Use Impacts of Bus Rapid Transit: Effects of BRT Station Proximity on Property Values along the Pittsburgh Martin Luther King, Jr. East Busway*. National Bus Rapid Transit Institute, University of South Florida.

Peterson, G. Unlocking Land Values to Finance Urban Infrastructure. Trend and Policy Options, World Bank and International Bank for Reconstruction and Development Policy Paper, 7. 2009.

Prosper Australia. 2016. The Role of Transport Connectivity on Stimulating Development and Economic Activity. Submission to the House of Representatives Standing Committee on Infrastructure, Transport and Cities. Accessed 2016. www.prosper.org.au

Reibel, M., E. Charnobai, and M. Carney. 2008. House Price Change and Highway Construction: Spatial and Temporal Heterogeneity. American Real Estate Society Conference.

Rephann, T., and A. Isserman. 1994. New Highways as Economic Development Tools: An Evaluation Using Quasi-Experimental Matching Methods. *Regional Science and Urban Economics*, Vol. 24, Issue 6, pp. 723–751.

Rodriguez, D., and F. Targa. 2004. Value of accessibility to Bogotá's bus rapid transit system. *Transport Reviews* 24(5): 587–610.

Ryan, S. 1999. Property values and transportation facilities: Finding the Transportation-Land Use Connection. *Journal of Planning Literature* 13(4): 412–427.

Rybeck, R. 2004. Using Value Capture to Finance Infrastructure and Encourage Compact Development. *Public Works Management and Policy Journal* (Sage), Vol. 8, No. 4, pp. 249–260. Accessed 2016. https://www.mwcog.org/uploads/committee-documents/k15fVl1f20080424150651.pdf.

Rybeck, R., and W. Rybeck. 2012. Break the Boom and Bust Cycle. *PM Magazine*, ICMA, pp. 6–10. Accessed 2016. http://webapps.icma.org/pm/9407/public/cover.cfm?author=Rick%20Rybeck%20and%20Walt%20Rybeck&title=Break%20the%20Boom%20and%20Bust%20Cycle&subtitle=.

Saginor, J., E. Dumbaugh, D. Ellis, and M. Xu. 2011. *Leveraging Land Development Returns to Finance Transport Infrastructure.* University Transportation Center for Mobility. UTCM Project 09-13-12. Final Report.

Samuelson, P. A. 1973. *Economics*, 9th Ed. McGraw-Hill. Chapter 3 and pp. 458–461.

Schalkenbach Foundation. 1963. The Pittsburg Graded Tax Plan. Accessed 2016. http://savingcommunities.org/docs/williams.percy/gradedtax.html.

Schatz, H., K. Kitchens, S. Rosenbloom, and M. Wachs. 2011. Highway Infrastructure and the Economy: Implications for Federal Policy. Rand Corporation.

Sedway Group. 1999. Regional Impact Study. Report commissioned by Bay Area Rapid Transit District (BART).

Siethoff, B. T., and K. Kockelman. 2002. Property Values and Highway Expansions: An Investigation of Timing, Size, Location and Use Effects. Accessed 2016. http://www.wilco.org/Portals/0/Departments/Roads/SH29/propvalues_and%20highways.pdf.

Smith, J., and T. A. Gihring. 2006. Financing Transit Systems Through Value Capture. *The American Journal of Economics and Sociology*, Vol. 65, No. 3.

Smith, J., T. A. Gihring, and T. Litman. 2016. Financing Transit Systems Through Value Capture: An Annotated Bibliography. Victoria Transport Policy Institute. Accessed 2016. http://www.vtpi.org/smith.pdf.

Southern California Association of Governments (SCAG). 2016. Paying for the Plan. Accessed 2016. http://scagrtpscs.net/Documents/2016/proposed/pf2016RTPSCS_06_PayingForThePlan.pdf.

Urban Land Institute. 2103. When the Road Price is Right. Land Use, Tools and Congestion Pricing.

Vadali, S. 2008. Tolls Roads and Economic Development: Exploring Effects on Property Values. *Annals of Regional Science* 42: 591–620.

Vadali, S. 2014. Using the Economic Value Created by Transportation to Fund Transportation. National Highway Cooperative Synthesis Project 459.

Versement Transport. n.d. Accessed 2016. https://en.wikipedia.org/wiki/Versement_transport.

Voith, R. 1991. Transportation, sorting and house values. *Journal of the American Real Estate & Urban Economics Association*, 19(2): 117–137.

Voith, R. 1993. Changing capitalization of CBD-oriented transportation systems: evidence from Philadelphia, 1970–1988. *Journal of Urban Economics*, 33(3): 361–376.

Walther, E., L. Hoel, L. Pignataro, and A. Bladikas. 1990. Value Capture Techniques in Transportation. DOT-T-90-11. Washington, DC: US Dept. of Transportation Program of University Research.

Walter, L. Land Value Capture in Policy and Practice. 2013. *Journal of Property Tax Assessment and Administration.*

Weinstein, B., and T. Clower. 2002. The impact of Dallas (Texas) area rapid transit light rail stations on taxable property valuations. *Australasian Journal of Regional Studies*, 8(3): 389.

Williams, P. R. 1962. Pittsburgh's Pioneering in Scientific Taxation. fn. 59. Republished as *The Pittsburgh Graded Tax Plan: Its History and Experience*.

Wray, S., S. Moses., and G. Weisbrod. The Development Impacts of Highway Interchanges in Major Urban Areas: Case study Findings. 2000. Accessed 2016. http://www.edrgroup.com/pdf/Hwy-Interchange-Case-Studies.pdf

Zhao, Z. 2014. *Value Increase and Value Capture. The Case of TH-610 in Minnesota*. Hubert Humphrey School of Public Affairs. University of Minnesota.