

New Priorities for Old Roads: Re-Thinking Roadway Preservation

By
Kathleen R. Sylvester

BS in Civil Engineering
Northwestern University
Evanston, Illinois (2005)

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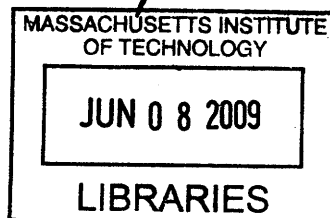
Kathleen R. Sylvester
Department of Urban Studies and Planning
May 20, 2009

Certified by _____

Ralph Gakenheimer
Professor Ralph Gakenheimer
Department of Urban Studies and Planning
Thesis Supervisor

Accepted by _____

Joseph Ferreira
Professor Joseph Ferreira
Chair, MCP Committee
Department of Urban Studies and Planning



ARCHIVES

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ABSTRACT

Most of the roads built over the last century in the US were built assuming that efficient mobility for drivers was most important without considering impacts to the natural or built environment. Urban neighborhoods were severed, ecologically sensitive areas were disrupted, and pedestrian, bicycle and transit accommodation was ignored. Public offense at this approach to road-building led to new policies and practices for more open, locally-based decision-making. Road construction is now subject to a higher level of scrutiny, yet investment in preserving existing roads is assumed with little public discussion even though preservation represents the majority of transportation expenditures. As public priorities shift toward favoring sustainable development and transforming out of auto-dependency, road preservation can be either a barrier or an opportunity.

This study examines whether and how road preservation investments support these new priorities. I use the Maryland State Highway Administration (MSHA) as a case study. As a national leader in context-sensitive solutions and in commitment to sustainable development, MSHA is expected to exhibit innovative use of system preservation expenditures to support local plans for more balanced, less auto-intensive transportation systems. I find that rather than integrate context-sensitivity and sustainability into all transportation programs, Asset Management-based preservation programs focus almost exclusively on cost-efficiency while alternate programs are created to address broader concerns. Policies for context-sensitive solutions, flexible transportation investment, and sustainable development have little bearing on Asset Management-based preservation investments. MSHA's Neighborhood Conservation program offers a good model for locally-based, flexible preservation investment, though the fund has been susceptible to budget cuts.

Asset Management systems are an important tool for managing risk and cost associated with an aging transportation system. However, as reliance on Asset Management-based investment grows, the narrow scope of these projects will undermine commitment to responsive, sustainable transportation investment. The decision-making process for these investments should be supplemented through small-area preservation planning, incentive funds for preservation project enhancements, and performance measures that focus investment on broad transportation goals in order to achieve reduced auto-dependency and transportation investment that supports public priorities.

Thesis Supervisor: Ralph Gakenheimer

Title: Professor Urban Studies and Planning

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List of Abbreviations

AASHTO: American Association of State Highway Officials

BPR: Bureau of Public Roads

CSS: Context Sensitive Solutions

CTP: Consolidated Transportation Plan

EIS: Environmental Impact Statement

FHWA: Federal Highway Administration

HPMS: Highway Performance Monitoring System

ISTEA: Intermodal Surface Transportation Efficiency Act, 1991

MDOT: Maryland Department of Transportation

MPO: Metropolitan Planning Organization

MSHA: Maryland State Highway Administration

MTP: Maryland Transportation Plan

NEPA: National Environmental Policy Act

TSM: Transportation System Management

USDOT: US Department of Transportation

CHAPTER 1: INTRODUCTION

1.1 Presenting Case

Consider a hypothetical suburban community. The community initially developed during the early twentieth century when a private streetcar line was built creating a reliable and convenient connection to the city center. The streetcar line no longer operates, though one of the old stations now operates as a commuter rail station, providing infrequent service to downtown. The small, historic business district near the train station has suffers from high turnover and high vacancy. Most of the apartment units above the first floor storefronts have been vacant for many years, and many of the buildings need renovation. The older neighborhoods near the business district are in quite good condition, and have been stable over the years. A large area of old farm land east of the historic area was developed with small single-family homes and a big box retail center in the 1960s after an old market road was upgraded to a grade-separated freeway.

Interest in revitalizing the old business district, desire for more active lifestyles, and concern about sustainability led the community to adopt an ambitious “green” master plan three years ago. The plan is focused on stimulating reinvestment in the business district and making it more accessible to the surrounding communities via walking, biking, transit and driving. The plan recommends a range of landscaping enhancements that will manage water quality and make the area more attractive. It also identifies needed connections across the freeway to link the newer neighborhoods with the town center.

The County Planning Board is supportive of the plan, as is the County Council. The year after the plan was adopted, the county spent \$500,000 to build a one-mile segment recreational trail between the train station and one of the local schools. Recently, an engineer from the State contacted the Director of Public Works for the county to discuss

plans for maintaining traffic flow during the upcoming rehabilitation of Main Street and resurfacing of the freeway to the east. The design plans for these projects will bring the roads up to current design standards, which means widening the road a bit and removing some of the trees that are within the “clear zone” required for safety reasons along the road. After discussing the community’s plan for the greening the area, the State engineer suggested some state funds that the county might be able to use to fund their desired improvements. The Public Works Director passed the information along to the county planning department and to the Planning Board. The local planner advocated pushing for the changes identified in the community plan as part of the upcoming State projects. Re-building the road as the state engineer described was counter-productive to the local objectives and unnecessary. Moreover, she had held several meeting with representatives of the homeowners association for the neighborhood east of the freeway who were pushing for a new, safe pedestrian connection across the freeway. A connection to let these residents access the downtown more easily would really help the businesses near the train station. The planning board concurred on some of these points, but was also swayed by some vocal residents of the neighborhood west of the freeway who did not want new connections and cut-through traffic, especially from the lower income east side of town. The State moved forward with their projects. These were routine projects, after all.

Two years later, in response to resident and business complaints that Main Street is worse than ever, the County has applied to the State for funding to provide pedestrian, bicycle and landscaping amenities along Main Street. Their application is granted, and they work with State engineers to come up with a design consistent with the community goals. Some trade-offs have to be made – there is not enough space for wide sidewalks, trees, and bicycle lanes between the edge of the paved traffic lanes and the storefronts, so bicycle lanes are foregone, and sidewalks are reduced to a more utilitarian width. The downtown business owners support of the project, but are frustrated that access will be disrupted yet again for construction. They work out an agreement for much of the

construction to be done in the morning and late evening hours, which adds about 15 percent to the project budget and means cutting back on some of the landscaping plans. After about three months of construction the project is complete, and while many are pleased with the new amenities, there is some confusion about why the project hadn't been done right the first time.

The County built some new sidewalks and on the east side of town too, but the freeway remains essentially unchanged and is still a major barrier to non-auto travel. Every five years or so the state repaves the freeway. Although it is recognized as a barrier achieving the local plan, no one knows quite how to go about changing it.

1.2 Overview

Transportation infrastructure has profound influence on economic activity and the structure of daily life. There are many examples of the importance of transportation innovation on settlement and prosperity. From shipping channels that opened new trade markets, to railroads that connected the US coast to coast, to early streetcars that enabled the first suburbs, to commercial air travel that has put nearly the entire world within a days travel. And without a doubt, the widespread adoption of the internal combustion engine facilitated by massive government support for road-building reshaped American cities and created an environment in which nearly everything built must be made compatible with the automobile.

Public interest in sustainability and deeper understanding of the consequences of auto-oriented development have grown since much of the nation's transportation infrastructure was built. While the public continues to demand a highly functional road system, there is also growing support for transformation from auto-dependency toward a development and mobility pattern with fewer of these impacts. Many states have enacted broadly targeted Smart Growth policies designed to focus public investments in

more sustainable development patterns. Additionally, local plans around the country increasingly incorporate sustainability principles and seek to create viable walking, biking and transit mobility options.

In the 1960s and 70s, environmental and civil rights activists protested the ignored impacts of road building. They forced federal policy innovations that required impact assessment and public disclosure. In the 1990s transportation agencies, frustrated that new regulations and mandated public involvement made it difficult to successfully build anything, devolved decision-making authority and adopted a context-sensitive approach to transportation that let transportation investments be led by local needs in order to reach actionable plans more quickly. Concurrent with these innovations, there were repeated efforts to focus government expenditures on system preservation, rather than expansion. Condition reporting, performance measurement and asset management systems were developed to yield more uniform, objective and cost-efficient decisions. In seeking to streamline decision-making, the asset management model for preservation investment risks excluding context-specific issues and opportunities for needed change. The preservation of all roads in their existing configuration is assumed to be necessary and appropriate, even though many of these roads would not be built today given current policies and public priorities.

The roads built over the last 100 years are deteriorating, and the majority of transportation funding for the foreseeable future will be spent maintaining and preserving them. Moreover, system preservation projects present opportunities for change on every road on a ten to fifteen year cycle, where major capital projects may affect roads only every 100 years or more. Safe, functional roads are still a high public priority, and so efficient roadway preservation is certainly desirable, but not to the exclusion of other public priorities. System preservation programming and decision-making need to be supplemented so that preservation spending contributes to building

a transportation system that will meet economic, environmental, social and cultural needs in the next century.

Considering how transportation planning and policy have changed to allow the flexibility and creativity needed to address the wide range of public values that are affected by transportation, I examine the current approach to system preservation to determine whether and how these considerations are incorporated into preservation projects. I focus my analysis on the Maryland State Highway Administration, which is a national leader in context-sensitive transportation planning, but struggles with the cost and complexity of system preservation like all state agencies. The Maryland case is not universal, but it does give an indication of the current state of the practice, structural obstacles, and the importance of various policies and actors in achieving desirable project outcomes.

1.3 Report Organization

In Chapter 2, I outline some national indicators of public priorities related to transportation and summarize national trends in transportation spending. In Chapter 3, I identify key innovations in transportation planning that follow a shift from viewing transportation as an end goal toward viewing transportation as a complex system that impacts a variety of public priorities. In Chapter 4, I discuss the development of roadway preservation practices and explain Transportation Asset Management. In Chapter 5, I briefly outline current federal transportation programs that influence roadway preservation. In Chapter 6, I review the state and local roles in roadway preservation, using Maryland State Highway Administration (MSHA) as a case study. And in Chapter 7, I summarize my findings and make some recommendations about actions federal, state, and local stakeholders can take to achieve roadway preservation that supports local and national priorities.

CHAPTER 2: PUBLIC PRIORITIES FOR TRANSPORTATION

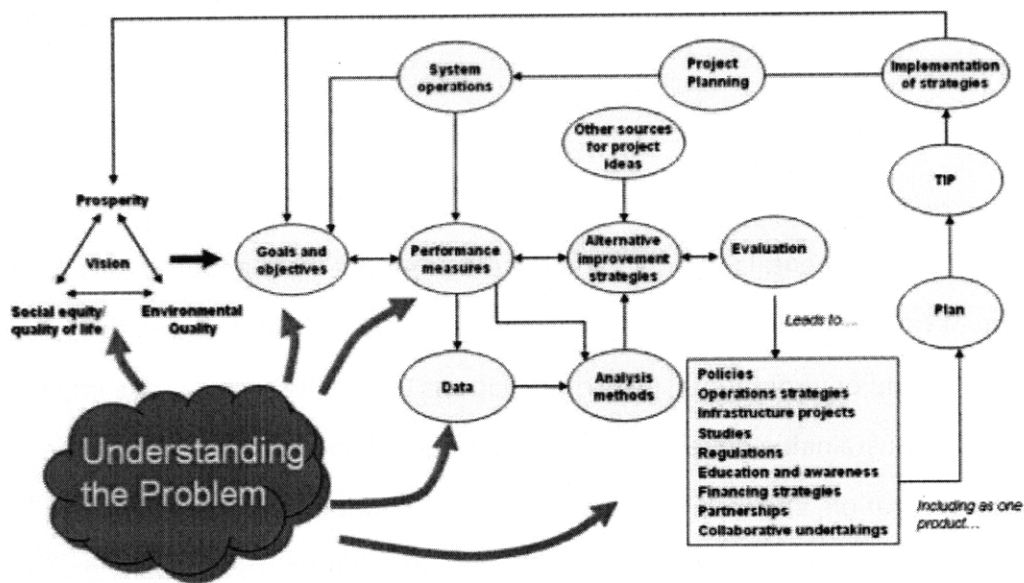
Certainly, there is not one set of values or public priorities that can be used to evaluate transportation investments. If anything, the last fifty years have shown the need to reject monolithic assumptions of values related to transportation in favor of flexibility and context-based decision-making. Nevertheless, a variety of indicators show increasing public interest in sustainable development and reduced dependence on automobile travel. There are still groups that advocate road-building to deal with congestion and to stimulate the economy, but new coalitions that advocate for transformation of transportation systems are gaining political strength. Transportation spending trends indicate declining support for road-building and increasing support for alternative transportation and system preservation. I provide a summary of some of those indicators in this chapter. My goal is not to provide an exhaustive review, but rather to highlight widespread public interest, action and commitment to sustainability in order to demonstrate that system preservation should not assume that rebuilding every roadway structure as it was originally built is appropriate.

2.1 Sustainability as the new Paradigm

Societal concern for the impacts of human development on the environment, and growing understanding of the role of development patterns in these impacts has led to a wide array of policy action to support sustainable development (Meyer and Miller 2001). Both the scientific understanding and public awareness of climate change have grown remarkably in the last decade, changing the public debate surrounding investments in automobile infrastructure. As the second largest and fastest growing contributor to greenhouse gas (GHG) emissions, the transportation sector is an essential element of plans to mitigate and adapt to climate change.

In 2001, Meyer and Miller noted that it was generally expected that transportation planning would become more oriented toward sustainable development in the coming years. In 2008, Schmidt and Meyer proposed a conceptual framework for transportation planning, reproduced below (Schmidt and Meyer 2008). As the framework illustrates, the sustainability paradigm affects the entire range of transportation planning activities and reflects a major shift in public priorities for transportation.

Figure 2.1 Sustainability Paradigm in Transportation Planning



Source: Schmidt and Meyer, 2008

The objective of sustainable development is to achieve environmental quality, social equity and economic prosperity over the long-term. Auto dependency is incompatible with each of the goals. In addition to deteriorating water and air quality, wetlands, and habitats, auto dependency leads to unsustainable levels of GHG emissions. There is growing awareness that regulation to increase vehicle fuel efficiency will not be sufficient to manage this impact (Sperling 2009). Auto dependency also denies fair access to people without access to vehicles or the ability to drive. The financial and social impacts of this isolation on the urban poor are well documented (Blumenberg 2004). Looking ahead, the need to provide to mobility to an aging population will

require non-auto travel solutions. And finally, auto dependency is inextricably linked with high congestion costs and dependence on foreign oil resources, which are problematic for economic prosperity.

Though it appears that the sustainability paradigm will direct transportation planning in the next generation, there is some opposition to its implications for transportation. Because the US economy is currently so dependent on automobile infrastructure, and because the auto-industry and road-building industry provide many jobs, many argue that continued investment in road infrastructure is important for near-term economic prosperity.

2.1.1 Federal Support

The National Environmental Policy Act and the Clean Air Act were adopted to regulate the impact of transportation on the natural environment. The Americans with Disabilities Act and environmental justice regulations target the social justice impacts of transportation. Sustainable development gained national political favor during the Clinton administration, and in 1996 the administration appointed a Council on Sustainable Development to study opportunities for integrating sustainability principles into US policies. In the last five years, the focus of the federal discussion surrounding transportation has shifted to the impact on global climate change. To date, federal policy has focused primarily on improving the efficiency of the vehicle fleet and reducing the carbon content of fuels; however more aggressive policies that focus on reducing vehicle-miles-traveled are under consideration. The Obama administration has shown new interest in taking federal action to reduce GHG emissions, which may create a new mandate for transportation solutions.

2.1.2 State and Local Government Support

State and metropolitan plans are increasingly focusing on reducing vehicle-miles-traveled (VMT) through building alternative transportation networks and revising

development and zoning codes (Schmidt and Meyer 2008). State and local Smart Growth, Growth Management, Livability, and Walkability policies have been enacted to target sustainable development goals. These policies acknowledge the links between development patterns, automobile use, and environmental consequences; and prioritize government expenditures that are expected to advance environmental preservation, social equity and economic development goals. As communities throughout America plan for the aging of their populations, new strategies are being developed to improve walkability and transit access for older Americans. Federal transportation funding was extended to non-motorized modes in 1991.

2.1.3 Public Support and Advocacy

Many public interest polls since the mid-1990s have reported strong public support for increasing spending on transit, walking, and bicycle networks (Surface Transportation 2000). Transportation for America, a relatively new organization that advocates for the transformation of government transportation spending to support balanced transportation solutions that will support American goals through the next century, has already gained with over 270 partners representing all fifty states (Zimmerman 2009). Leadership for reductions in automobile use have been most successful at the local level, where they have been less threatening to highway lobbies and have been linked to land use policies.

2.2 Planning and Development Strategies

Smart Growth and Livable Cities movements have become very popular across the country. The strategies and policies they entail promote balanced transportation systems and less dependence on personal automobile travel. Because these strategies address a variety of interdependent issues that affect the structure of daily life, they are complex and controversial. These policies are implemented differently in different locations and are often revised based on the outcomes and consequences they generate.

2.2.1 Smart Growth

Smart Growth stresses environmental preservation, compact mixed-use development, social equity, and multimodal accessibility. Smart Growth policies are focused on changing land use, but use transportation investments as a mechanism for incentivizing these changes. It links transportation with environmental, economic, aesthetic, and public health goals. The land uses, densities and design recommendations supported by Smart Growth create opportunities for achieving mobility through walking, biking and transit. Planners began to promote many Smart Growth concepts in the early 1970s, but it was not until the 1990s that the Smart Growth concept garnered political popularity and Smart Growth policies and plans began to be adopted across the country. There is a wide range of policies related to Smart Growth, and elements of Smart Growth have been implemented in different ways across the country. According to one survey, thirty-nine states have enacted Smart Growth policies (Bolen 2008).

Critics of Smart Growth policies claim that the policies disfavor minorities and drive up housing prices by restricting growth (QuantEcon). In addition, critics contest the argument used to justify Smart Growth policies that the cost of providing infrastructure and services is lower for more compact growth patterns (Cox and Utt).

2.2.2 Livable Cities

Livable Cities initiatives argue for public decision-making based on desired characteristics of the places people wish to live, and arises as a reaction to unlivable aspects of existing places. A transportation system that provides service to all people, to all areas, at reasonable cost is a core element of livability. Livable Cities programs support “balanced” transportation systems, that is, they recognize that the automobile will continue to play an important role in most U.S. communities, but advocate building pedestrian, bicycle and transit networks to supplement the automobile network. A balanced system is designed so that each mode performs its role where it is most

efficient (Vuchic 1999). Many reports document efforts to achieve balance transportation (see Dunlay and Soyk 1978, Gordon 1997, Project for Public Spaces 1997, Pucher and Hirshmann 1993). Achieving balanced transportation will also require adapting existing roadways to make them more compatible with non-auto travel.

2.3 Role of Transportation System Preservation

Although road building slowed, roadway spending increased more than 50 percent between 1984 and 2004 in constant dollars (Transact 2005). Much of that increase funded road preservation. About one hundred preservation projects are completed for every new route or relocation completed. Most roads may not be evaluated or modified as part of a new route or widening project for a hundred years or more, yet preservation projects touch almost every road, generally on a 5 to 15 year cycle. Although they are small projects, these are a tremendous opportunity to revisit the transportation investment decisions of the last century.

Public priorities and the growing focus on sustainability has led to transportation programs that increase local flexibility in the use of transportation funds and to increase funding for alternative transportation modes. System preservation is a significant and growing portion of transportation expenditures. Using system preservation expenditures to perpetuate the interstate era status quo, as appears to be the case, will undermine efforts to advance new sustainability priorities within transportation.

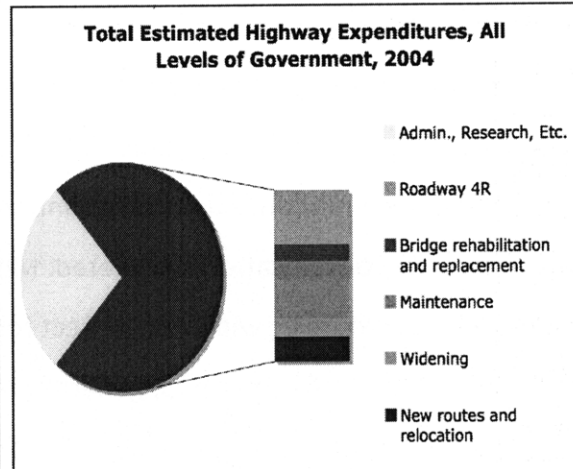
2.3.1 Public Expenditures

Major capital projects such as new routes and major widening make up just over ten percent of government transportation spending. Roadway and bridge rehabilitation, reconstruction, resurfacing, and repair (4R) projects make up about 30 percent of highway spending. All levels of US government spend about \$200 million dollars per year on transportation. More than 70 percent of government spending on

transportation goes to highways, and only about 10 percent of this is spent on new routes. About five times the amount spent on new routes is spent maintaining and repairing roads and bridges.

Figure 2.2 Total Estimated Highway Expenditures 2004

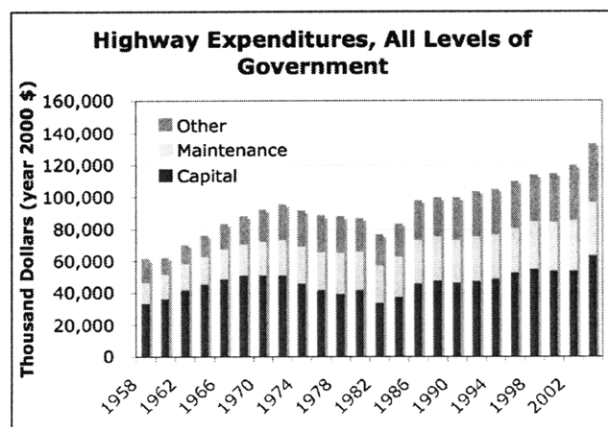
Maintenance	\$36 Billion
Roadway reconstruction, rehabilitation, resurfacing, repair	\$34 Billion
Bridge rehabilitation and replacement	\$11 Billion
Widening	\$12 Billion
New routes and relocation	\$16 Billion
Safety and Law Enforcement	\$12 Billion
Interest and Bonds	\$14 Billion
Administration and Research	\$13 Billion
Other	\$2 Billion
TOTAL	\$147 Billion



Data compiled from FHWA Highway Statistics Archive Reports

Roadway and bridge 4R projects are part of capital transportation budgets, whereas, maintenance is part of the operations budget. Roadway maintenance expenditures have more than doubled since the 1960s, and now represent the largest category of transportation spending; however, these expenditures are funded through the operating budget and fund small-scale, routine activities like snow removal, landscaping, pavement crack-sealing, and filling potholes. The scale of these projects is too small to present opportunities for transforming the roadways. Roadway and bridge 4R

Figure 2.3 Highway Expenditures



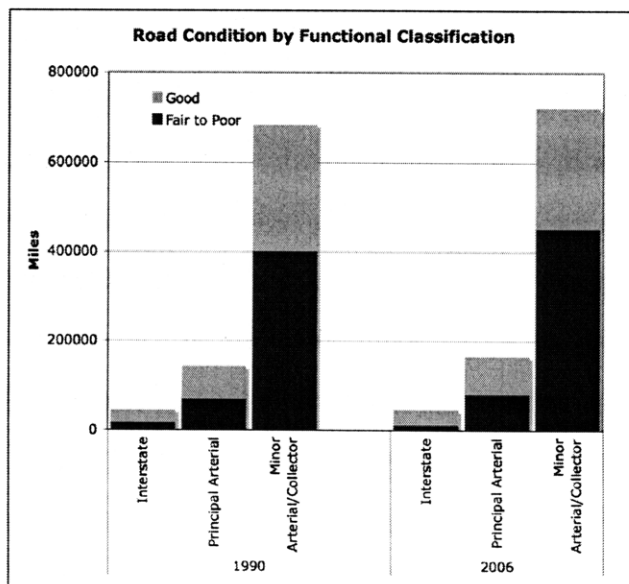
projects represent a growing portion of capital expenditures. Between 1997 and 2004, the share of capital funds used for 4R projects rose from 47.6 percent to 51.8 percent (US DOT 2006).

The American Recovery and Reinvestment Act passed in January 2009 allocated an additional \$27.5 billion in federal funds to the Surface Transportation Program, which is the most flexible federal funding program. Though there was discussion of doing so, Congress did not require any portion of the additional funds to be spent on system preservation. The funds must be expended within 120 days, though petitions for up to a one-year extension will be considered, so in effect, most of these funds will be spent on minor projects like system preservation because the timeframe does not permit major project development.

2.3.2 Future Funding Outlook

In 2001, half the nation’s roadways and nearly 70 percent of urban roadways were in poor, mediocre, or fair condition (Transact 2003). Interstates are in better condition than arterial and collector roadways, and more than 70 percent of all interstates were in good very good condition in 2006. Urban road condition lags significantly behind rural condition. About 65 percent of rural principal arterials were in good or better condition in 2006, while just over 30 percent of urban principal arterial were rated good or better. Urban bridges are also in worse condition than rural bridges, and about 30 percent of all urban

Figure 2.4 Road Condition by Classification



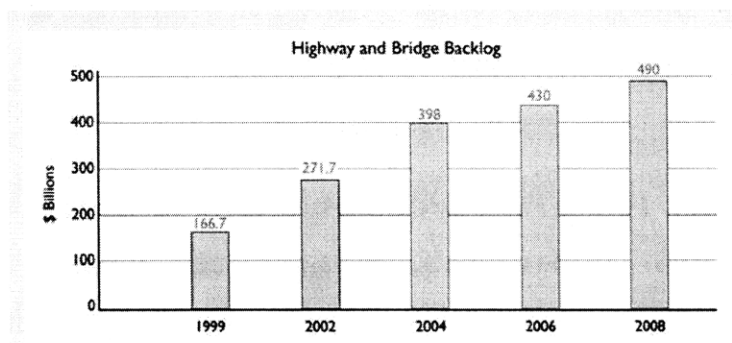
Data source: FHWA Highway Statistics Archive

bridges are structurally or functionally deficient. Urban arterials, which are in the worst condition, are the roads with the most complex demands and greatest opportunities for transformation.

Despite the growth in roadway upkeep spending, there is still a need for major increases in funding. Only about half of the nation's roads are in good condition, and about 15 percent of the nation's bridges are structurally deficient.

According to the US DOT's 2002 Conditions and Performance report, capital investment by all levels of government remains well below the level needed to maintain the condition of the highway and transit systems (US DOT 2002). The 2008 AASHTO update of 2006

Figure 2.5 Preservation Needs



Source AASHTO 2009 Bottom Line Report

NCHRP Needs Report calls for \$118 billion per year to maintain highway infrastructure in 2010, increasing to \$161 billion per year by 2020. To improve highway condition, these funding targets increase to \$167 billion in 2010 and \$227 billion in 2020 (AASHTO 2009). These figures include funds for system expansions and enhancements, but exclude maintenance. AASHTO recommends about 55 percent of these figures be used for system rehabilitation. These funding levels amount to doubling 2004 capital investments in system preservation by 2010.

CHAPTER 3: KEY INNOVATIONS IN TRANSPORTATION PLANNING

The precedents set during the early years of Interstate building created a culture of road building based on calculated impacts to drivers. As public priorities and understanding of the impacts of road building evolved, public policy and transportation planning have had to change as well. Though the profession still struggles to move beyond the Interstate era culture, there have been many changes in transportation policy and practice that reflect changing public values and technologies. In this chapter, I focus on three key innovations that represent a shift toward incorporating broad public priorities for the built and social environment into transportation decision-making: linkages to other policy goals; public involvement; and flexibility.

3.1 History Overview

Before the automobile became a dominant force in US cities, city plans centered around grand boulevards as well as parks and plazas. While these plans considered the functional demands on these streets and boulevards, the roads were envisioned as civic centerpieces to give order to urban activity and growth. Their design philosophy was principally aesthetic rather than practical (Brown 2006).

Americans adopted private automobiles rapidly, and by the mid-1920s downtown business owners and city officials worried that congestion in city centers threatened downtown economies. They hired transportation planners to resolve the congestion problem. Planners responded in Progressive Era fashion with reproducible, technical studies designed to move automobile traffic more efficiently. Transportation planners presented their studies as objective analysis, although their definition of problem reflected their own and their clients' biases and preconceptions (Alchon 1985). Rigid regulations transformed city streets from social spaces into purely functional traffic

spaces. The urban freeway emerged as the scientific response to the congestion problem. In many cities freeways were explicitly designed and deployed as physical barriers to separate white neighborhoods from African American neighborhoods (Brown 2005).

By the mid-1930s there were many advocates for a connected system of long-distance controlled-access highways to connect major cities across the US. The 1944 Federal-Aid Act authorized a 40,000 mile System of Interstate and instituted the gas tax. The policy precedent of financing roads with a dedicated user-fee, rather than general revenue, is very significant to the history highway construction in the US. Rather than being viewed as public expenditure that needed to serve overall public objectives, highway construction came to be viewed as independent of other public goals and expenditures. Motorists were now paying for the roads, so anything that did not benefit them was seen as wasteful and inappropriate as part of a highway expenditure.

The notion that slow-moving automobile traffic was prima facie a bad thing became institutionalized, was a key principle underlying planning for the interstate highway program, and is still reflected in the professional fixation with maintaining roadway level of service – which is simply a measure of motor vehicle speed. (Brown 2006 p13)

The Federal-Aid Highway Act of 1956, credited as truly beginning of the Interstate Era, laid out a plan to authorize \$24.8 billion between 1957 and 1969 for construction of the Interstate system at a 90-percent federal match rate. Cities ceded control over most aspects of freeway development and planning to state and federal highway engineers in order to take advantage of billions of dollars of federal aid. The federal aid system empowered state highway agencies with designing and building urban highways, although they had little experience with urban issues and generally paid little attention to the impacts that construction of freeways would have on the form and character of local urban environments (Vuchic 1999). Furthermore, Congress' decision to limit the mileage of the interstate system encouraged states to build sparse networks of very

large facilities rather than dense networks of smaller facilities (Taylor 2000). This rational planning methodology resulted in serious neglect of non-monetary and non-quantitative aspects of transportation policies and plans (Kuhn 1962). Facilities were placed where they could serve the most traffic at low cost, resulting in the use of parkland, division of neighborhoods, and destruction of the fabric of historic districts (Brown 2005). Reports passed off as planning studies, were really development plans, designed to select a preferred alignment based on a mechanistic evaluation of costs and benefits to system users, rather than to the general public. (Vuchic 1999).

The “rational choice” transportation planning process that evolved during the Interstate era was based on the single criterion of lowest cost to move the highest number of automobiles. Early efforts to improve transportation planning focused on developing quantitative tools, and generally ignored the political and social dynamics of decision-making (Meyer and Miller 2001 p55).

Important legacies from this era of transportation planning include a narrow professional focus on guaranteeing easy traffic movement at the lowest possible cost; a tendency on the part of many practitioners to resist the involvement of non-expert others in the decision-making process; and a tendency to use data as weapons in conflicts over decisions with these non expert others (Brown 2006).

3.1.1 Freeway Revolts and Tear-Downs

Freeway construction had few opponents when Interstate funding was initially authorized, but by the late 1950s anti-freeway sentiment was emerging as urban residents began to see the negative consequences of large-scale freeway construction. Growing awareness that highway building strained government financial capabilities, generated environmental and social consequences, and often induced additional travel led highway protest groups to advocate transit solutions rather than more highway construction (Gakenheimer and Meyer in Altshuler 1979). Highway planning continued

to rely on traffic data and desire lines as the primary determinants of route alignment. Public attention became focused on the consequences of human actions on the environment, including air, land, water, and ecological impacts of transportation decisions. Citizens were concerned that changes were being made to their communities without their views being considered (Weiner 1997). The public began to question the underlying attitudes of the experts responsible for transportation planning and began to question the implicit assumptions related to facilitating motor vehicle travel (Meyer and Miller 2001).

In the 1960s and 70s, civil rights activists and environmental activists joined together in the anti-freeway movement and demanded changes in transportation policy. They criticized the transportation planning process for inadequate treatment of the social and environmental impacts of transportation facilities; for focusing only on long-term plans and ignoring more immediate problems; and for using rigid technical procedures to justify bad projects (Weiner 1997). The rational approach to transportation planning was broadly criticized, both by academics as well (see Braybrooke and Lindblom).

Altshuler identified several characteristics of transportation planning that became problematic in the 1960s, including:

- Transportation planners assumed there was public consensus that the mission of transportation planning was to provide the most cost-effective means of expanding the highway network.
- The vision of a future heavily reliant on the automobile was firmly ingrained in the profession.
- Transportation planners felt that this consensus made it unnecessary to deal directly with elected officials or affected citizens.
- Transportation planners sought a single best way to solve transportation problems.
- Comprehensive plans were based on long-term regional scale projections.

Several unpopular urban freeway routes were canceled, and in Massachusetts, Governor Sargent ordered a moratorium on major highway building in 1969. In 1977,

Harbor Drive in Portland, Oregon was torn down and replaced with a 37-acre park. Three other American cities have since torn down elevated freeways, and several others are considering doing the same. Massachusetts recently completed the Central Artery/Tunnel (Big Dig) project, which was a twenty-five year \$22 billion effort to repair the urban fabric that was disrupted by an elevated freeway. Freeway tear-downs are very visible examples that highlight how different project outcomes can be when the public, rather than highway engineers, are making decisions.

Public opposition, compounded by two oil embargoes that demonstrated the risk of energy dependence; economic restructuring; and mounting evidence of the deterioration of the existing highway system slowed highway building almost to a halt in the 1970s and 80s. The policy and practice innovations emerged out of this situation, including acknowledging linkages to other policy goals; improving public involvement; and enabling much more flexibility in transportation expenditures. These three innovations are incorporated into a new theory of practice based on devolved, project-specific decision-making. The Context-Sensitive Solutions practice developed in the late 1990s is based on this new decision-making model.

3.2 Linking to other Policy Goals

Incrementally beginning in the 1960s, linkages between transportation and other social, economic and environmental goals were acknowledged in federal policy and state agency practices. Transportation planning during this period began to address a mix of concerns for environment, social equity, safety, citizen involvement, and energy conservation, in addition to traditional mobility considerations (Gakenheimer and Meyer in Altshuler 1979). These linkages introduced legal and financial constraints on transportation programs, and also introduced many additional actors to the transportation planning process (Meyer and Miller 2001).

The 1962 Federal-Aid Highway Act introduced the first specific guidance for transportation planning, requiring any federal aid project in an urbanized area to be based on a “continuing, comprehensive, and cooperative” transportation planning process. It required the planning to be done at the metropolitan or regional level rather than locally. The “comprehensive” component of the process required that planning include economic factors, population, land use, transportation facilities, travel patterns, zoning, financial factors, and social and community factors (Weiner 1997). Despite the stated intent of the 1962 Act, the practice of narrow, freeway-dominated planning continued (Vuchic 1999).

The USDOT Act of 1966 created the US Department of Transportation (USDOT) and the Bureau of Public Roads was transferred into the USDOT under its new name, the Federal Highway Administration (FHWA). It created the highway beautification program and prohibited the use of parkland for transportation projects when a prudent or feasible alternative existed. In the same year, the FHWA issued a regulation requiring the consideration of social, economic, and environmental effects; the consideration of alternative action plans; and the involvement of the public and other state agencies as part of the application for federal highway aid.

Despite the policy linkages established in the 1970s, it was not until the 1990s that the legislative wording of federal transportation programs began to change to indicate that urban development, quality of life, and environmental preservation were part of the core mission of transportation expenditures.

3.2.1 Environmental Impacts

Congress and environmental activists through the National Environmental Policy Act (NEPA) imposed consideration of environmental impacts on transportation agencies in 1969. NEPA required a detailed Environmental Impact Statement (EIS) for any major action significantly affecting the quality of the human environment. The EIS is first

prepared in draft form, circulated for comment to the public and government agencies, and then the lead federal agency publishes a final EIS. The environmental impact review process mandated under the National Environmental Policy Act (NEPA) did not prohibit projects with negative environmental impacts, but by mandating public involvement and disclosure of impacts, it became an extremely important element in DOT decision-making and elevated the quality of the discussion and the underlying analysis (Convisser in Altshuler 1979). In creating new procedural requirements, NEPA forced institutional changes within DOT, including creating a whole staff throughout the agency with explicit environmental responsibilities. Additionally, NEPA fostered increased communication between federal, state and local agencies. The opportunity for public comment often leads to early coordination in order to avoid adverse comments on the public record (Convisser in Altshuler 1979). While this can improve institutional decision-making, it can also subvert the public disclosure goal by encouraging more “off the books” discussions and negotiations.

The 1973 Clean Air Act bolstered the environmental linkage with transportation and its subsequent amendments, which place requirements on transportation projects to conform with air quality standards.

3.2.2 Equity Impacts

By the 1970s American settlement patterns had extended significantly and transit service had deteriorated so that those without access to an automobile were often severely mobility impaired. Lobbying campaigns for the elderly and handicapped drew attention to the equity impacts of highway building. Research on spatial mismatch between jobs and housing for low-income and minorities showed that urban freeways and the settlement patterns they enabled created social isolation and limited access to jobs. Although these linkages motivated Civil Rights activists to partner with environmental activists in protesting the interstate era approach to transportation planning, equity linkages with transportation were not acknowledged through policy

until the 1990s when Congress passed the Americans with Disabilities Act and the Clinton administration added environmental justice to the requirements for environmental impact statements.

3.3 Public Involvement

In 1966 FHWA mandated a two-hearing public involvement process for highway projects to process to give community members an opportunity to review both route location and final design. The community impact assessment process described by the FHWA directed transportation professionals to develop a community profile, analyze project impacts and identify potential solutions. The public role was simply to react to the professionals' proposals. Less than a year later the FHWA amended public involvement requirements again to require citizen participation in all phases of the planning process from the setting of goals through the analysis of alternatives. The disclosure requirements and public involvement mandates under the NEPA legislation led to broader recognition of the environmental and social impacts of freeway building. Additional federal policy changes in the 1970s required public involvement at throughout planning and project development.

Policies mandated public involvement, but did not mandate how public priorities should be integrated into project design. The public had been given more power in decisions about road-building, but highway engineers had not yet adapted to the new balance of power. Transportation officials were not trained to manage projects through public processes, and policy requirements left room for a lot of variability in the effectiveness of the public involvement process.

In many cases, transportation agencies followed the procedural requirements for community interaction, without real commitment to making decisions based on meaningful public evaluation of the trade-offs. The "success" of public involvement was

often measured based on the number of people that attended meetings or the percentage of people that responded to a survey. As early as 1974 there were calls for better interaction and better measures based on whether or not all affected persons were allowed an equal opportunity to participate; understood the planning process and issues of choice; and whether their contributions and preferences were given due consideration by the decision-makers.

Process requirements for public involvement without outcome or consensus mandates that describe how public opinion should affect transportation project design led to frustration and stalled projects. The public hearing requirements created a forum for activists to react to projects before design was finalized, but highway engineers were not required to redesign projects based on public input. Additionally, less active stakeholders were still often left out of the public review process, resulting in controversy and project delay later in the design process. In practice, many public involvement efforts were focused on avoiding delays due to legal action, rather than achieving meaningful public participation. Broader involvement began a transition from justifying projects solely in terms of anticipated mobility and created the need for flexibility in highway design.

Successful public involvement is difficult to measure. Public involvement is often measured by the number of people who attended meetings, the number of people contacted, or the number of survey responses received. These are poor metrics of the quality of the participation. Successful participation entails transparent, meaningful discussion of the assumptions, values and priorities involved in a project. It is not simply requesting comments on a proposal. It requires recognition from decision-makers that non-expert stakeholders have valuable knowledge that will help find the better solutions, as well as a commitment to respect the values and priorities of the local stakeholders even when they differ from decision-makers'. It does not require decision-makers to give up their responsibilities to ensure safe and functional design solutions.

While there is still varying commitment to public involvement within transportation agencies, the requirements for increased public involvement show acknowledgment among policymakers that transportation decision are not simple optimization exercises that engineers can carry out, and that monolithic value assumptions from policy makers cannot substitute for local stakeholder evaluations of project-specific trade-offs.

3.4 Flexibility

Flexibility in transportation was first codified in the 1970s through federal policy changes that shifted the focus of transportation planning from long-term to short-term needs in order to be responsive to public demands. Long-term planning was based on the concept that a particular set of values could be applied to all transportation projects over a long period of time. Shorter range planning was grounded in the concept that values and trade-offs vary and need to be re-evaluated frequently.

Flexibility in transportation became a core focus of federal transportation policy in the 1990s. The 1991 Intermodal Surface Transportation Efficiency Act (ISTEA) created a new set of federal programs that gave state and local governments much more freedom to assign transportation funds to a variety of purposes and modes. In 1995 US Code was changed to specifically allow design flexibility on the National Highway System.

Flexibility in design standards followed with a new design guidebook, *Flexibility in Highway Design*, published by AASHTO in 1997. This guidebook encourages flexibility in highway design in order to accommodate context-specific factors and reduce conflicts between traditional highway design and environmental and community values (AASHTO 1997).

3.4.1 ISTE A

The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 set a direction for federal transportation policy in the post-interstate era that incorporated the lessons and innovations of the previous decades. It gave states new flexibility to use federal transportation funds according to their particular priorities, reinforced the importance of transportation planning, strengthened the role of MPOs, and for the first time made federal transportation funding available for non-motorized modes. It gave states design flexibility for roads not in the National Highway System.¹ ISTEA emphasized that the goal in transportation planning was improving accessibility, which could be best accomplished through coordinated intermodal systems, rather than highways alone (Vuchic 1999).

ISTEA devolved authority for transportation planning and programming to state and metropolitan agencies and attempted to indoctrinate an ethic focused on overall social, economic, energy, and environmental effects of transportation decisions, rather than capacity expansions. Specific planning criteria for both Metropolitan Planning Organizations (MPOs) and state Departments of Transportation (DOTs) in ISTEA emphasize a holistic approach to planning, an expanded view of system performance from level-of-service to include mobility, access, reliability, security, social equity, and environmental and quality of life impacts; requirements for cooperation and consultation between agencies; and a strong emphasis on proactive, ongoing, inclusive public involvement. Although similar policy statements can be found going back 40 years ISTEA succeeded where previous federal laws failed to invoke social goals into transportation because it translated the policy vision into specific provisions, linking general policy directions to both planning requirements and funding mechanisms (Camph 1994). ISTEA removed much of the federal control over project selection, but it maintained or increased federal review of planning and design processes. Decentralizing

¹ Flexible design standards on all roads, including the NHS, was extended under the National Highway System Act of 1995.

federal policy allows regions and states to determine the priorities for their investments independently.

Through these elements, ISTEA organized a shift in the management of transportation agencies with diverse needs, resources, and values. The flexibility and intermodalism allowed and required under ISTEA presented the need for major institutional change in state and federal transportation agencies. In the years after ISTEA was implemented, several studies reported institutional barriers to implementing the objectives of ISTEA (Meyer and Miller 2001 p43). In many cases States and MPOs hired consultants to do plans rather than doing them in-house because of lack of resources and discomfort with the new requirements ("ISTEA" 1991). While this is not necessarily a good or bad result, it slowed the culture change within the organizations that ISTEA tried to effect. New ideas were overlaid on the old way of doing business. Many state agencies used the flexibility in ISTEA to continue funding traditional highway projects and minimized use of new funds and purposes.

ISTEA attempted to pair new flexibility to with the development of state-level management systems that would help set priorities for the use transportation funds and help address transportation needs from a technical standpoint so that resource allocation would not be totally politically driven (Weingroff). However, the management systems requirement was rescinded based on state and MPO objections that they did not have the capacity, technical tools or resources to execute the requirements.

3.5 Context-Sensitive Solutions

By the 1990s, state transportation agencies began recognized that a new model of roadway planning was needed in order to successfully build roadway projects in urban areas. Context-Sensitive Solutions (CSS), the term coined to describe this new theory of practice, embraces local partnerships throughout project development and tailors

roadway design to the local communities. Rather than viewing road design as an engineering exercise in geometry and drainage, it calls on state highway planners and engineers to think of road design as an iterative, flexible process that had to take into account economic development, historic and cultural identity, multimodal accommodation, environmental preservation and other factors.

FHWA and AASHTO partnered with state transportation agencies to develop CSS design tools, guidelines and research in the late 1990s. The goal in developing these tools was to define a new vision for transportation design that would simultaneously advance safety, mobility, enhancement of the natural environment and preservation of community values (Thinking Beyond). A National Training Steering Committee was created in 1998 to oversee pilot efforts to institutionalize context sensitive design principles in Connecticut, Kentucky, Maryland, Minnesota, and Utah.

Organizational culture, including how employees in an organization expect to be treated, what they value, and how they conduct their business, is extremely important to CSS. Leadership from the top of an organization has been key to the successful implementation of CSS (NCHRP 480). Organizational change requires changes in thinking, changes in roles and responsibilities, and changes in work processes.

The CSS approach to highway design considers the role of the roadway in supporting active community life and seeks opportunities to contribute to a wide range of community goals. It calls for interdisciplinary collaboration between technical professionals, local interest groups, landowners, and essentially all stakeholders who will live and work near or use the road (NCHRP 480). Context-sensitive design is about both process and outcomes.

CSS projects involve a full range of stakeholders throughout project development; from scoping and problem definition onward. Multiple alternatives are considered, and

opportunities for enhancements, such as extending bicycle, pedestrian, or wildlife corridor, providing economic development opportunities, improving connectivity, improving transit operation, or improving the appearance of a corridor and encouraged as part of project development. Agency staff work with stakeholders to secure funds for these project elements. The NCHRP Guide for CSS recommends starting alternatives development “with a blank sheet of paper”, in order to encourage creativity.

The NCHRP Guide for CSS Project Management Checklist summarizes the key elements of CSS:

- The project satisfies the purpose and needs as agreed by a full range of stakeholders.
- The project is a safe facility both for users and the community.
- The project is in harmony with the community and preserves environmental, scenic, aesthetic, historic, and natural values of the area.
- The project involves efficient and effective use of resources of all parties.
- The project is designed and built with minimal disruption to the community.
- The project exceeds the expectations of both designers and stakeholders.

In 2007, 41 states had made significant progress implementing context-sensitive solutions in their standard practices, including 35 states with formal CSS policies (PennDOT). The remainder of the states had initiated CSS efforts.

While CSS represents the culmination of many innovations in transportation policy and planning since the interstate era, it is criticized for being susceptible to favoring parochial interests over broader social goals.

The public reaction to transportation planning from the 1960s onward demonstrates that a rigid set of assumed values and priorities is not sufficient for balancing the trade-offs and linkages involved in transportation decisions. Many of the trade-offs can only be effectively evaluated through a finer-grained, context-specific process. The CSS

approach recognizes this and creates an inclusive process for evaluating these trade-offs; however, the CSS process does not ensure that regional, state or national priorities are reflected in projects. CSS projects have resulted in many successful, creative design solutions that often serve a variety of needs and goals, but balancing local interests and broader public interests remains a challenge.

CHAPTER 4: INNOVATIONS ROADWAY PRESERVATION MANAGEMENT

Initially, federal highway funding was structured to fund system expansion, assuming that states would manage maintenance and preservation costs. Maintenance and preservation, however, are not political winners because they do not provide new benefits, and so the budgets are consistently short-changed in every state. When road maintenance and preservation are neglected, life-cycle costs increase dramatically. The Federal Highway Administration (FHWA) has tried to encourage states to adequately fund maintenance and preservation since the late 1960s. Since the 1990s, FHWA has pushed for the development of transportation Asset Management systems to overcome the political and management challenges associated with controlling cost and road condition.

4.1 History

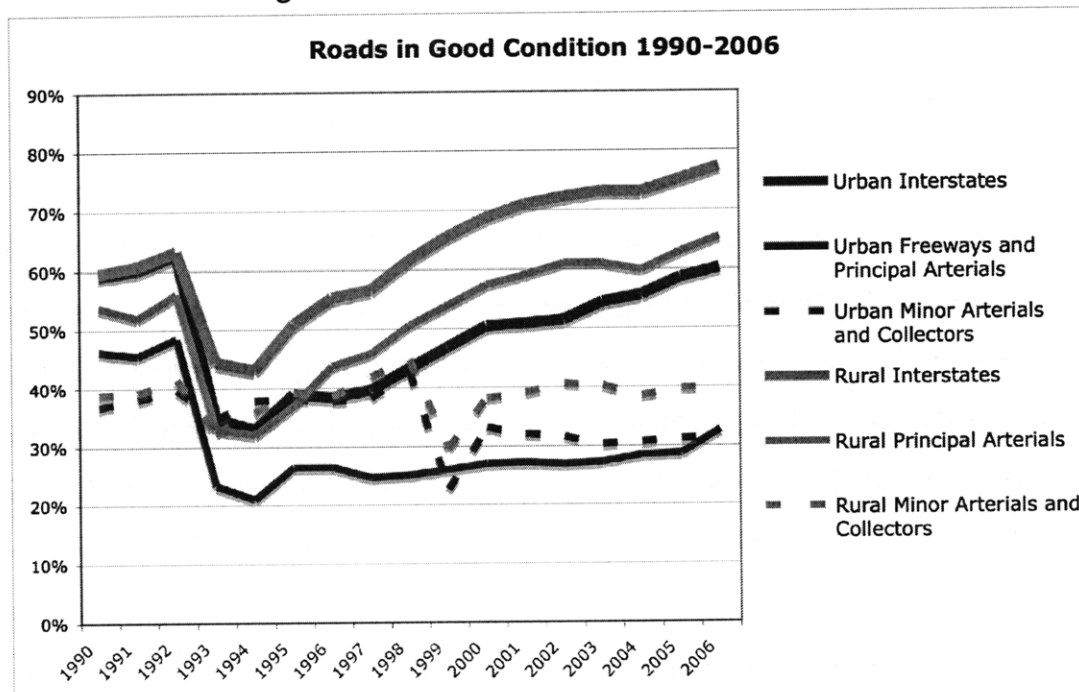
Before the 1980s, the ability to use federal funds for road preservation and maintenance was very limited. This created a significant disincentive for state and local agencies to fund preservation because they were not able to leverage federal funds for these expenditures. A stagnant economy, high inflation and reductions in oil use in the 1970s led to serious transportation budget shortages and led transportation agencies to focus on short-term, low-capital solutions rather than system expansion.

The federal government supported Transportation System Management (TSM) in the 1970s for prioritizing low-cost projects to improve system efficiency and condition. Metropolitan Planning Organizations (MPOs) were given responsibility for developing the plans for these projects. MPOs had traditionally been focused on long-range planning, and were not equipped with skills for short-term planning. They were not very

effective, in part because they viewed TSM as competing with their long-term planning objectives (Gakenheimer and Meyer in Altshuler 1979).

Federal policy began to allow federal funds to be used for preservation and maintenance. The 1976 Federal-Aid Highway Act allowed federal funds to be expended on resurfacing, restoration, and rehabilitation of designated Interstates. In 1982 the federal gas tax was increased five cents per gallon, and much of the additional revenue was directed to resurfacing, restoration, rehabilitation, and reconstruction (4R). 4R funds were distributed to the states by formula, rather than based on demonstrated need. The funding was significant, but only covered about half of the estimated need. However, when most federal transportation programs were cut by 10-25 percent in 1987, 4R funding was held at \$2.8 billion per year (Weiner 1997).

Figure 4.1 Road Condition, 1990-2006



Data Source FHWA Highway Statistics Archives

Roadway system condition improved somewhat in the late 1980s, but the costs and risks of deferred maintenance remained a national concern. In 1983 a section of the

Mianus River Bridge on Interstate 95 collapsed, and in 1988 the National Council on Infrastructure Improvement recommended drastic increases in infrastructure maintenance (Amekudzi). Despite the calls for increased investment in preservation and maintenance, pavement condition deteriorated rapidly in the early 1990s on all road classifications, and in 1993 less than 35 percent of federal-aid roads were in good condition.

Since the mid-1990s, pavement condition has improved steadily, particularly on Interstates. Urban roads remain in much worse condition than rural roads. Urban arterials and freeways are in the worst condition nationwide, with just 30 percent in good condition. These roads are often complex both because of the constraints for maintaining traffic flow during repair, and because of the number of stakeholders and interests affected by the roads. The complexities can lead transportation agencies to avoid these projects.

4.2 Condition Reporting

Roadway conditions reporting is used to draw attention to the need for investment in infrastructure preservation and to justify expenditures. After the collapse of the Silver Bridge in Point Pleasant, West Virginia in 1967 the USDOT mandated formal bridge inspection, maintenance and improvement programs, and federal agencies took the lead in coordinating condition reporting for transportation infrastructure.

The first FHWA report on the condition of the nation's highways and bridges was issued in 1968. Updates have been issued eleven times since then. The conditions report is designed to offer comprehensive, uniform, factual data to support the development and evaluation of policies and funding at all levels of government (FHWA 2006). State departments of transportation are required to provide highway conditions and performance data to FHWA using the Highway Performance Monitoring System (HPMS).

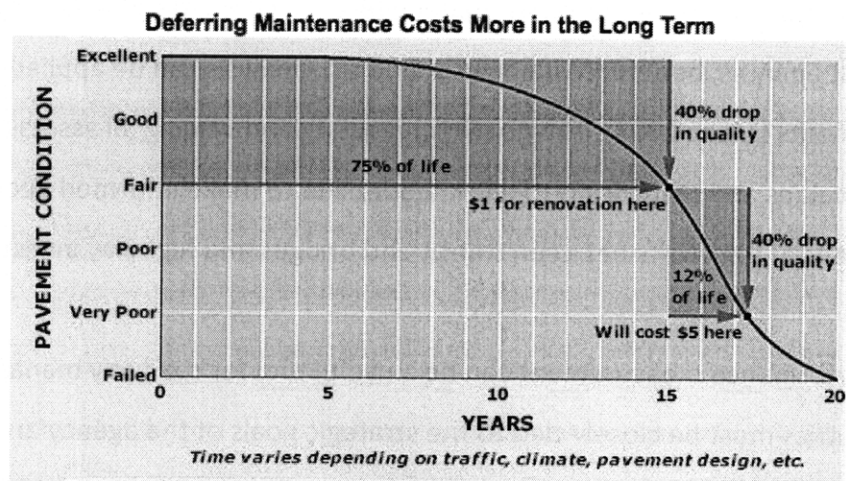
The HPMS was developed in the 1970s and includes a statistically drawn sample of 100,000 highway sections in the US. Revisions to the HPMS are currently under review. Bridge data are obtained from the National Bridge Inventory collected annually by the FHWA. Conditions reporting requirements laid the groundwork for asset management systems by requiring every state to maintain a database of road and bridge conditions.

4.3 Life-Cycle Cost

In the 1960s and 1970s state transportation agencies prioritized maintenance and rehabilitation activities based on a worst-first approach. As international research began to demonstrate that deferring maintenance increases life-cycle costs, agencies began to shift toward prioritizing preservation projects based on life-cycle cost projection. FHWA encouraged this

shift through research and technical assistance, but did little to incentivize new business practices until about ten years ago.

Figure 4.2 Life-Cycle Maintenance Costs



Source: Surface Transportation Policy Partnership, The State of our Nations' Roads

The 1999 Government Accounting Standards Board Statement 34 changed the requirements for state and local government financial reports on the value of infrastructure assets. The statement allowed local governments to value their assets based on life-cycle valuation estimates rather than depreciation. This option spurred major national research on asset valuation and management and provided additional financial incentives for preventive maintenance and life-cycle cost management.

4.4 Performance Measurement

Performance measurement is a concept adopted from private sector management that monitors progress toward policy goals and objectives using quantifiable measures.

FHWA, the National Academy of Science, AASHTO and others encourage a performance-based approach to managing transportation assets that evaluates asset conditions and the cost-efficiency of managing those assets.

Most performance measures currently in use are abstract engineering measures, such as bridge health and ride quality. A research report published by the Midwest Regional University Transportation Center indicates that next step in performance measurement is to monetize all benefits so that engineering economic analysis tools such as life-cycle cost analysis, benefit/cost analysis, and risk analysis can be applied to maximize total benefits (Maze 2008). The goal in measuring and valuing all assets using a common set of values and statistics is to allow leadership to make informed decisions about the financial trade offs between transit and bridges and highway investments (Pagano).

Performance measurement can be a useful tool for roadway management, but the metrics must be closely tied to the strategic goals of the agency and must be careful to include important project elements that are difficult to quantify. Performance measures are easily suited to quantifiable metrics such as time and cost per unit. Care must be taken to evaluate the incentives these measures create. For example, metrics of schedule adherence may penalize delays that arise due to extending a process to allow additional time for public involvement. Metrics of unit cost may deter project managers from including enhancements or features desired by stakeholders. Project delivery metrics are also problematic as they may deter managers from addressing public concerns or unforeseen issues that may affect time and cost to completion.

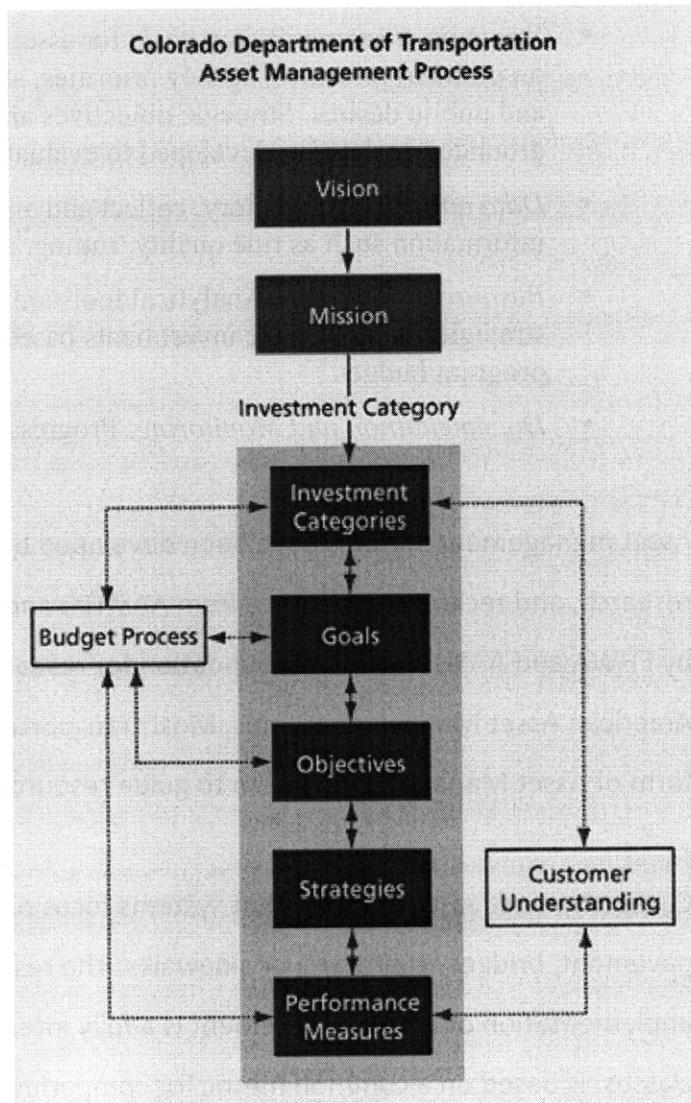
Performance goals that reflect user priorities and values such as ride smoothness, level

of service, travel time, system mobility, and availability of facilities are valuable, but should not overshadow quality of life and environmental values (US DOT 1999).

4.5 Asset Management

Asset management is a systematic approach to prioritizing investment in transportation assets over long time horizons based on measurable data and performance objectives. Many of the principles of asset management come from private sector management theory and have been adapted by US transportation agencies for the last 15 years. Much of the US guidance was developed based on the International Infrastructure Management Manual developed in New Zealand, where the approach was first applied to privately owned roads.

Figure 4.3 Model Asset Management System



Source: FHWA Asset Management Case Studies, available online at: <http://www.fhwa.dot.gov/infrastructure/>

Asset management is seen as a way to improve efficiency, productivity and accountability in order to increase the value to transportation users. It uses models that draw from economics and engineering, and is designed to maximize benefits for users while minimizing agency costs (US DOT 1999).

The asset management model, shown to the right, is a fairly sequential process, with goals set at the beginning, and little opportunity for project-specific re-evaluation or iteration. Asset management systems vary, but generally involve the following elements:

- *Strategic planning:* Policy goals for asset management are established based on political priorities, agency priorities, statutory requirements, system needs, and public desires. Strategic objectives and performance measures that are grounded in data are developed to evaluate progress toward the policy goals.
- *Data collection:* Inventory, collect and analyze system performance information such as ride quality, rutting, and other quantifiable measures.
- *Resource Allocation:* Analytical tools are used to produce resource allocation strategies that optimize investments based on performance measures and the program budget.
- *Documentation and Monitoring:* Progress toward strategic goals is evaluated.

Asset management systems have been developed by state agencies, based on guidance, research, and technical assistance from AASHTO and FHWA. A 1995 conference hosted by FHWA and AASHTO laid the foundation for research and development of many American Asset Management tools. Most transportation agencies are now using some form of Asset Management system to guide resource allocation.

Currently, most asset management systems focus on just one asset class, for example, pavement, bridges, guardrails, or sidewalks. The research vision for future implementation of asset management is a fully integrated system that includes all asset classes; is based on a common metric for comparing all costs and benefits; and provides alternative investment options across those asset classes. Agencies do not yet fully embrace this idea. The trend toward the expanded use of analytical tools will be challenging to implement because of the high-level of data collection and coordination required and because of the importance of political factors in resource allocation.

Transportation managers reported that asset management systems make funding allocations more transparent, enable more proactive policy formulation, and depoliticize the distribution of funds for large system preservation categories (Pagano; Maze 2008). The FHWA Asset Management Primer explains that Asset management can enhance the dialogue among decision-making bodies regarding investment levels because it is fact-based, reproducible and systematic (US DOT 1999).

While asset management is a powerful tool for managing a large, complex network of transportation assets, the data-driven methods have much in common with the rational planning approach to transportation decision-making that dominated the interstate era. The asset management approach relies on a rigid set of values and goals that are assumed to fit every resource allocation decision. Developing an appropriate set of priorities and performance measures, and maintaining the flexibility to adjust the recommendations of the system based on context-specific factors are key challenges with the use of asset management systems. Public reaction to the assumption that improving the efficiency of automobile traffic was the only important consideration for expenditures in the interstate program demonstrates that transportation agencies need to incorporate a broader range of objectives into asset management decision-making. Reliance on complex analytical processes for resource allocation creates a dependence on technical experts to translate analytical results into relevant conclusions and policy implications. Maintaining transparency in this process and incorporating meaningful public involvement are additional challenges. And finally, just as the Context Sensitive Solutions approach to design is susceptible to valuing parochial interests over broader public goals, the asset management approach to system preservation is susceptible to valuing broad notions of public values without flexibility to accommodate local priorities and objectives.

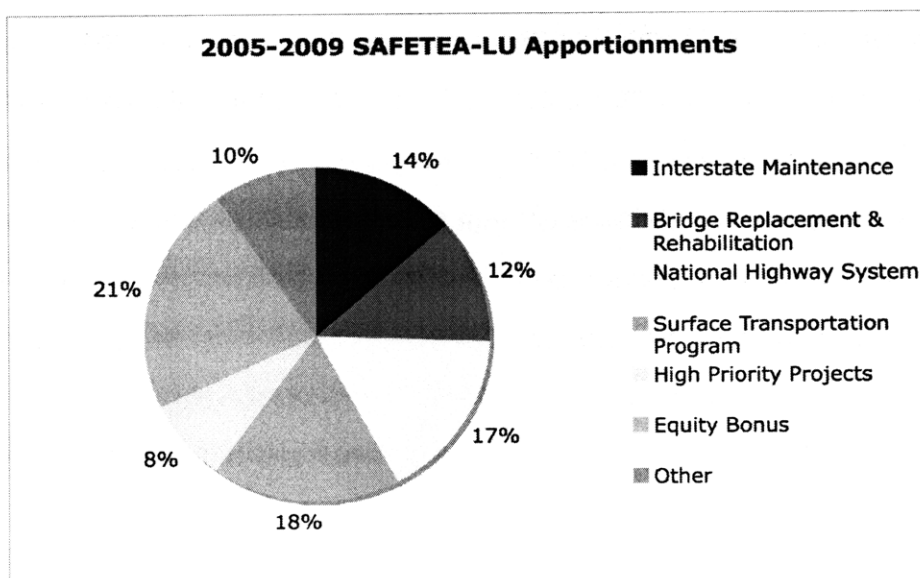
CHAPTER 5: FEDERAL FUNDING FOR ROADWAY PRESERVATION

The federal funding system has become very complex in response to the wide range of priorities that transportation is expected to address, and there is tremendous variability among state spending patterns. Federal policy supports transportation expenditures based on community enhancement and long-term mobility needs, and it requires a base level of condition monitoring and system preservation from the states. There are over 200 federal funding programs, and in addition pork-barrel projects have grown rapidly as legislators seek to accommodate community desires for transportation projects that are not assured through the funding formulas and criteria. Overall, federal transportation policy over the last twenty years has segmented and carved out programs for many transportation-related values, but has done little to direct priorities between these values.

5.1 SAFETEA-LU

The current federal transportation Act, Safe Accountable Flexible Efficient Transportation Equity Act– A Legacy for Users (SAFETEA-LU), directs federal roadway

Figure 5.1 2005-2009 SAFETEA-LU Apportionments



apportionments through four main programs: Interstate Maintenance, Bridge Rehabilitation and Replacement, the Surface Transportation Program, and the National Highway System. The Equity Bonus program, which ensures that each state receives a designated rate of return on its contributions to the highway trust fund, makes up 21 percent of federal funding. Equity Bonus funds are added to base funding for the four primary programs and do not have their own funding requirements. In addition, about 18 percent of funds are designated for specific projects, other minor programs and planning. Thus, 82 percent of federal highway funds are guided by the four main program requirements. There are many smaller programs nested within these programs designed to accommodate specific objectives.

Since ISTEA, much more flexibility has been permitted in the use of federal transportation funds. Surface Transportation and National Highway System funds are the most flexible, these funds can be used for highway or transit projects. The Interstate Maintenance program and the Bridge Replacement and Rehabilitation fund are explicitly for preservation projects; however, Surface Transportation Program and National highway System funds can also be used for preservation and reconstruction. Federal funds cannot be used to fund routine maintenance, such as filling potholes, sealing pavement cracks, and maintaining roadway landscaping. The preservation activities must add to the life of the asset.

Surface Transportation Program funding may be used for projects on any Federal-aid highway, including the NHS, bridge projects on any public road, transit capital projects, bus terminals and facilities, and environmental restoration. National Highway System funds can be used for highway or transit improvements and for environmental restoration in National Highway System corridors.

Interstate Maintenance funds can be used for preservation and reconstruction of the interstate system, but a state can transfer up to 50 percent of its Interstate

Maintenance apportionment to any of the other three major programs. The Highway Bridge Program is the least flexible. These funds can be expended on replacement, rehabilitation and systematic preventive maintenance of highway bridges.

ISTEA initiated the Transportation Enhancements program, which sets aside 10 percent of each state's Surface Transportation Program allocation for pedestrian, bike, safety, cultural, landscaping and other amenities to be incorporated into transportation systems.

The Federal share is up to 80 percent. Transportation Enhancement (TE) funds can be used for a wide range of activities that benefit the traveling public and help communities to increase transportation choices and access, enhance the built and natural environment, and provide a sense of place. To be eligible for funding, a TE project must relate to surface transportation, but can include pedestrian and bicycle facilities, safety or education; acquisition or preservation of historic sites or transportation facilities; rail-trails; landscaping; environmental mitigation; and others.

5.2 Re-Authorization

SAFETEA-LU expires in September of this year, and Congress is currently working on the next transportation spending bill. Transportation for America, a national advocacy organization, and the Obama administration are advocating for a transportation bill that will set a new direction for transportation in the 21st century. Climate change, demographic changes, global economic competitiveness, public health, and poor system condition are cited as evidence of a needed transformation of the US transportation system. Proposed national priorities to guide spending under the new bill include planning, state of good repair, safety, equitable access, and environmental preservation (Zimmerman 2009).

A performance, outcome-oriented system has widespread support. Under a performance-based system, national priorities would be established along with target measures for those priorities. State and regional plans would then be required to show how they would attain those metrics.

CHAPTER 6: STATE AND LOCAL ROLES IN ROADWAY PRESERVATION: MARYLAND EXAMPLE

6.1 Overview

While the federal government sets national policy, provides financial and technical assistance, and conducts research and standards, state and local transportation agencies have a great deal of discretion in directing transportation funds. State transportation agencies are involved in every stage of transportation projects from planning and budgeting through construction and maintenance, and they have authority over location, size, condition, functionality, aesthetic and enhancements. A review of state-level policies and practices is needed to understand how the innovations related to devolved, context-sensitive decision-making and those related to efficient asset management affect road preservation and to understand to what extent the current state of the practice serves broad public priorities related to transportation.

Precisely because transportation is so closely related to social objectives and priorities, transportation practices vary locally. However, all state agencies face similar challenges related to managing their assets efficiently and meeting policy requirements and public demands. Maryland's commitment to Smart Growth and environmental stewardship, and the Maryland State Highway Administration's (MSHA) reputation as a leader in Context-Sensitive Solutions make it a good candidate for innovative practices in using system preservation funding to meet broader social objectives. I investigate how federal and state policy direction and local public priorities are carried through in the implementation of roadway preservation projects, and highlight successful practices as well as opportunities for improvement. While each state's transportation agency must respond to unique politics, priorities, and financial constraints, the MSHA case offers a good model of the challenges and successes in the current state of the practice.

The Maryland State Highway Administration (MSHA) is responsible for about 17,000 lane miles of roads and 2,500 bridges, making it one of the smaller state highway departments in the country. MSHA is a modal agency within the Maryland Department of Transportation. Toll roads in Maryland are operated by a separate entity, the Maryland Transportation Authority (MdTA), and Baltimore City manages all roads within the city limits, including Interstates. The Washington Metropolitan Area Transit Authority (WMATA) provides bus and rail service in portions of Maryland. The Maryland Transit Authority (MTA) provides rail and bus service in the Baltimore metropolitan area and provides commuter rail service in several corridors throughout the state.

6.2 State Priorities and Policy Direction

Maryland is one of the smallest and most urbanized states in the country and both the Washington DC and Baltimore areas have high levels of congestion. Nearly 90 percent of Maryland's 5.6 million residents reside in urban areas. The state has over 7,000 miles of shoreline along the Atlantic Ocean and the Chesapeake Bay, making it the 4th most at-risk state in the nation for sea level rises due to increasing global temperatures. The State's environmental sensitivity and the environmental degradation of the Bay led Maryland to adopt fairly progressive environmental policies and were key arguments for the adoption of Smart Growth legislation in the 1990s.

6.2.1 Smart Growth

In 1997, Maryland enacted six pieces of legislation that made up its Smart Growth program, making it the first state to adopt a major package of Smart Growth laws. The program targeted more compact development within existing towns and cities and preservation of rural farms and forests. The program included laws for rural preservation, brownfields cleanup, job creation, the right to farm, "live near your work" incentives, and Priority Funding Areas for growth-related public investments.

The Smart Growth legislation uses state transportation funding as an incentive for projects that are consistent with state land use and economic development goals. Transportation spending makes up 85 percent of state spending subject to the provisions of the smart growth laws (Knaap 2008).

Maryland demonstrates, I believe, that transportation dollars can be effectively leveraged to achieve other goals – community redevelopment goals, transportation goals, and business development goals.

– Parris Glendening, former Maryland Governor in Keynote address at the Smart Growth and Transportation Conference 2002.

The current administration's *Maryland: Smart, Green & Growing* initiative builds on the smart growth legislation with a more explicit focus on sustainable development. As part of this initiative, the Maryland Department of Planning is currently leading development of the first State Development Plan, which is intended to promote healthy communities and environmental conservation by coordinating economic development, physical development and environmental restoration (MTP 2009).

6.2.2 Climate Action Plan

The Governor's Climate Change Commission released the state's first Climate Action Plan in August 2008. The Plan includes Statewide goals for reducing GHG emissions by creating new transportation and land use policies, increasing the use of cleaner fuels, improving transit service, and promoting land use options that reduce the need for single-occupant vehicle use (Maryland Climate Change Commission 2008). The Plan called for a variety of legislative actions to achieve its goals. In 2009, the Maryland general Assembly passed several of these recommended laws. The two most directly related to the transportation sector are:

- Greenhouse Gas Reduction Act: sets a cap on statewide carbon emissions, reducing emissions 25 percent by 2020.
- Financing for Transit-Oriented Development: Allows local governments to use tax increment financing to facilitate transit-oriented development projects.

- Maryland’s transportation sector contributes 30 percent of the State’s GHG emissions.

6.2.3 Maryland Transportation Plan (MTP)

The Maryland Transportation Plan (MTP) is MDOT’s 20-year vision for transportation. The policy goals and objectives in the plan guide development of the consolidated transportation plan, which guides the allocation of transportation funds in the state. MDOT updates the plan every five years through consultation with state and local agencies and the public. Public outreach efforts include interviews, meetings, an interactive website, online surveys, and newsletters.

The 2009 MTP emphasizes investment in system preservation and providing for a more sustainable future. The mission of the Maryland Department of Transportation, as stated in the 2009 MTP is to “enhance the quality of life for Maryland’s citizens by providing a balanced and sustainable multimodal transportation system for safe, efficient passenger and freight movement”. Five goals and objectives are identified to achieve the MTP vision.

Table 6.1 MDOT Goals and Objectives

Goal	MDOT Objective	MSHA Future Strategies
Quality of Service	Enhance users access to, and positive experience with all MDOT transportation services.	Evaluate managed lanes, congestion pricing and related strategies.
Safety and Security	Take a strategic approach to identifying safety challenges and developing engineering, education, enforcements and emergency response solutions.	Improve motor carrier safety compliance, complete emergency traffic management and evacuation plans
System Preservation & Performance	System preservation is MDOT's top priority, and funding for new capital expansion projects will be limited. Protect Maryland's investment in its transportation system through strategies to preserve existing assets and maximize the efficient use of resources and infrastructure.	Maintain State roadway pavements and a rigorous bridge inspection program, minimize delay on arterial highways through signal retiming and optimization.
Environmental Stewardship	Protect the natural, community and historic resources and encourage development in areas that are best able to support growth.	Develop an Environmental Stewardship Program, develop long-term corridor improvement plans in partnership with local governments, explore innovative stormwater management practices.
Connectivity for Daily Life	Support economic growth through strategic investments in a balanced, multimodal transportation system.	Provide park-and-ride facilities, complete the Intercounty Connector

Two of the goals, Environmental Stewardship and Connectivity for Daily Life, are closely related to the state Smart Growth and Climate policies. The others are traditional transportation agency responsibilities that do not address linkages to policy goals outside the transportation sector.

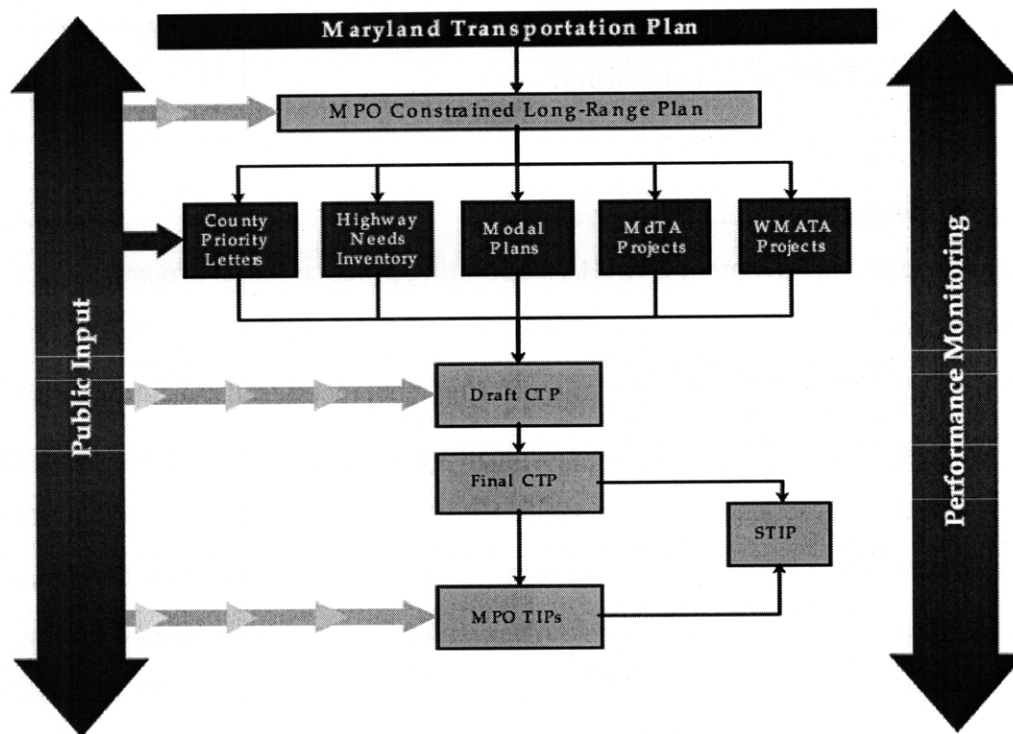
6.2.4 Consolidated Transportation Plan (CTP)

The MTP guides the development of the Consolidated Transportation Plan (CTP) and the Statewide Transportation Improvement Program (STIP), which are short-term fiscally constrained plans required for state and federal resource allocation.

Each county submits a Priority Letter to MDOT each year ranking the projects deemed most important based on local need and input. MDOT meets with county staff, MPOs, MSHA district engineers, and local officials to review the priorities. MSHA staff work

with the state’s MPOs to identify and prioritize major capital needs within the state, though the MPOs have little involvement with system preservation planning (Interview transcription with J. Smith in Maze 2008). Once a draft statewide plan is prepared, the Secretary of MDOT visits each County and Baltimore City to present and solicit input from local officials, state legislators, and citizens. MDOT then prepares the final CTP.

Figure 6.1 Maryland Transportation Planning



Source: MDOT 2009 Annual Report

6.3 MSHA Organizational Strategies

6.3.1 Organizational Structure

MSHA is a modal administration within the Maryland Department of Transportation (MDOT). All of Maryland’s transportation funds are allocated through the state transportation trust fund, and flow through MDOT to the modal administrations. MSHA manages its 3,200 employees through a fairly centralized management structure.

The state is divided into seven geographic districts, each managed by a District Engineer who is responsible for managing the highway and bridge construction contracts, maintenance, traffic engineering and operations within the district. Planning and design for major projects throughout the state are managed by staff in the central office. The District Engineers report to the Deputy Administrator for Operations, Maintenance and Safety, who reports to the MSHA Administrator. The MSHA Administrator is not an appointed position. The districts are small enough that district staff maintain a high level of familiarity with local officials as well as maintenance, safety, drainage, sidewalk, and streetscape needs on the state network.

6.3.2 Thinking Beyond the Pavement

Thinking Beyond the Pavement is MSHA's operating practice for all projects. It is a context-sensitive design strategy for aligning transportation planning with land use decisions, supporting Smart Growth, and offering a balanced transportation system where walking, bicycling and transit are realistic options (MSHA 2001). MSHA designed and instituted the practice in the mid-1990s through workshops, guidelines, training programs, and policy changes. Commitment to the new approach was thorough, and involved efforts throughout the agency. After leading a national workshop on the concept and being selected as a FHWA pilot agency, MSHA created a TBTP leadership team, reviewed all agency policies for compatibility with the new practice, and created staff training programs that focused on community involvement skill, and modified interview criteria to help hire staff aligned with TBTP values. In 1998, Bob Douglass the MSHA deputy chief engineer, wrote a memo banning the use of the state's design manual because the templates were oversized and stymied creativity among engineers (Ewing 2001).

We use context-sensitive design in Maryland...we are working with the community and trying to develop projects that become assets to the community...we try to build bicycle and pedestrian compatibility into virtually all of our projects...we look at transit as an element of our

highway projects...and we try to combine our improvements with other state and locally funded improvements...

--Neil Pederson, SHA Administrator at the Smart Growth and Transportation conferences, 2002.

The 2001 MSHA issued the guidebook, *When Main Street is a State Highway* outlining a TBTP process of project development that calls for participation of all parties in order to ensure that the needs of the affected community and the needs of the transportation network are blended successfully. The TBTP process is focused on creativity and collaboration with public stakeholders at each stage of project development. The guidebook encourages the project team to move away from a standards-driven process to a flexible, iterative, community-friendly approach.

At a Context Sensitive Solutions Peer Exchange in 2006, the SHA Administrator identified the following vision for CSS in Maryland in 2011 (cited in PennDOT 2008):

- CSS will be the way of doing business throughout the life cycle of a project, from preplanning through maintenance.
- Result in solutions that provide a net improvement to the community and environment
- Meet needs and community goals as defined by a full range of stakeholders
- Include the full involvement of stakeholders throughout decision-making, in a way that is consistent with the broader vision for the community and environment,
- And include teams of multidisciplinary experts who all contribute to developing solutions together with stakeholders.

6.3.3 Performance Measurement

MSHA uses performance measures at several management levels to monitor agency work. Performance is reported to the state legislature and the public annually through the Annual Attainment Report. In addition, performance measures for the six Key Performance Areas (KPA's) identified in MSHA's business plans are reviewed at bi-weekly meetings, and presented to the Governor's StateStat office monthly.

The Annual Attainment Report on Transportation System Performance is submitted to the state legislature to demonstrate progress toward achieving the goals and objectives of the MTP. Forty-five performance measures are presented in the Attainment Report that assess core agency functions and evaluate the progress of the policies promoted by the MTP goals and objectives. The 2009 MSHA performance measures are listed below, along with my categorization of the focus of the performance measure. There are very few performance measures that measure multiple objectives, and all of the system preservation metrics are focused exclusively on roadway performance.

Table 6.2 2009 Annual Attainment Report MSHA Performance Measures

Goal	Performance Measures	Performance	Balanced Transportation	Environmental Quality	Enhancement
Quality of Service	Maryland driver satisfaction based on weighted average score for 22 questions	X			
	Percentage of MSHA network in preferred maintenance condition	X			
Safety and Security	Annual number of fatalities and personal injuries on all Maryland roads	X	X		
	Annual number of bicycle fatalities and personal injuries on all Maryland roads	X	X		
	Annual number of pedestrian fatalities and personal injuries on all Maryland roads	X	X		
System Preservation & Performance	Number of structurally deficient bridges	X			
	Percent of roadway miles with acceptable ride condition (based on International Roughness Index)	X			
	User cost savings for traveling public due to incident management based on the CHART incident response data	X			
Environmental Stewardship	Acres of wetlands restored			X	
	Miles of streams restored			X	
	Ethanol fuel usage of 3,700 state-owned cars and light trucks			X	
	Reduction in VMT through park-and-ride usage		X		
Connectivity for Daily Life	Percentage of state-owned roadway centerline miles with a bicycle level of comfort grade "D" or better.		X		
	Mileage of SHA-owned highways with marked bike lanes		X		
	Percentage of state-owned roadway centerline miles within urban areas that have sidewalks that meet ADA compliance		X		
	Percent of freeway lane-miles and arterial lane-miles with average annual volumes at or above congested levels	X			

The performance measures in the MSHA Business Plan parallel those identified in the Attainment Report, but are more specific. For example, the overall Pavement Condition reported in the Attainment Report is broken down as into 10 performance measures in

the Business Plan that identify the funds programmed and expended for resurfacing; tons of asphalt produced; number of lane-miles resurfaced; and percentage of MSHA network with acceptable rutting, cracking and overall condition.

The performance measures help focus agency activities and help determine funding levels for specific programs. Most of the performance measures relate to roadway performance, a few relate to alternative transportation. Investment consistent with community values and quality of life objectives are not easy to evaluate with performance, and, although it is a core part of MSHA's mission, none of the sixteen MSHA performance measures in the Attainment Report evaluates this. Performance measures are focused on short-term goals. The MSHA Administrator noted the potential conflict related to evaluating projects that serve multiple goals based on a performance metric and cost-effectiveness evaluation based on only one of the goals. "We either look at the value to improving pavement or the value for improving mobility; rather than the value for all these combined...this is because the project comes for one funding source and so it follows the formula for that source..." (N. Pederson personal communication 25 March 2009).

6.3.4 Asset Management

MSHA uses asset management to give credibility to their decision-making and generate trust with the legislature that funds will be used wisely to maintain and improve the highway system. The asset management systems have helped protect the agency from accusations of politicizing the project selection process (Maze 2008).

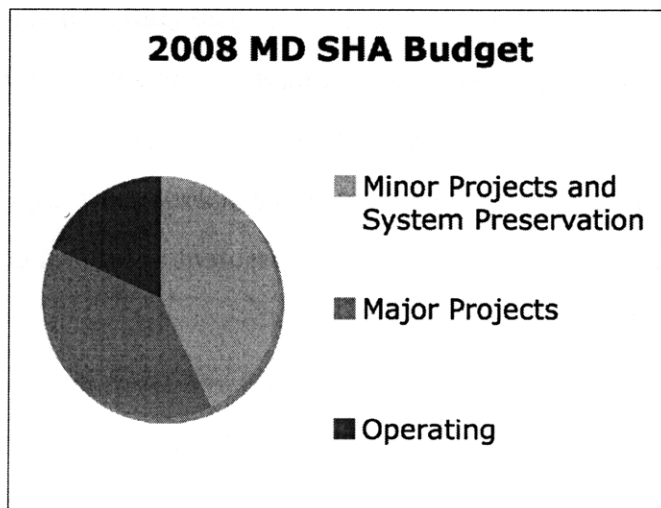
The pavement management system is based on yearly condition assessment, life-cycle cost models, and cost estimates for a variety of treatments. MSHA is currently adjusting the pavement management system to define project benefits in terms of lane-miles repaired, based on the advice of the FHWA (MSHA Annual Report 2008).

At the direction of the Administrator, the MSHA's Asset Management steering committee is working to build additional asset management systems for other asset classes such as street lighting, drainage, signs, and guardrails. The steering committee's working vision for Asset Management is, "utilization of a technical and rational decision making process for the optimal allocation of resources among asset categories, and for determining the appropriate remedial strategies within asset categories to minimize long-term costs consistent with desired levels of service" (MSHA Asset Management steering committee working documents).

6.4 System Preservation Programming

MSHA's system preservation budget is over \$600,000 per year, representing about 45 percent of MSHA's total budget and 13 percent of the total state transportation budget. This does not include the budget for routine maintenance activities, such as filling potholes, sealing pavement cracks, and maintaining street lighting. These activities are funded through MSHA's operating budget. About half of the System Preservation funds come from federal allocations, whereas 80 to 90 percent of Major Projects funds come from federal sources (N. Pederson personal communication 25 March 2009).

MSHA allocates System Preservation funds through about 25 purpose-specific funds. The categories are internally generated and funding can be moved between funds at the discretion of the administration, but this is rarely done as the narrowly defined funds are used as a means to protect budgeted levels particularly for small programs

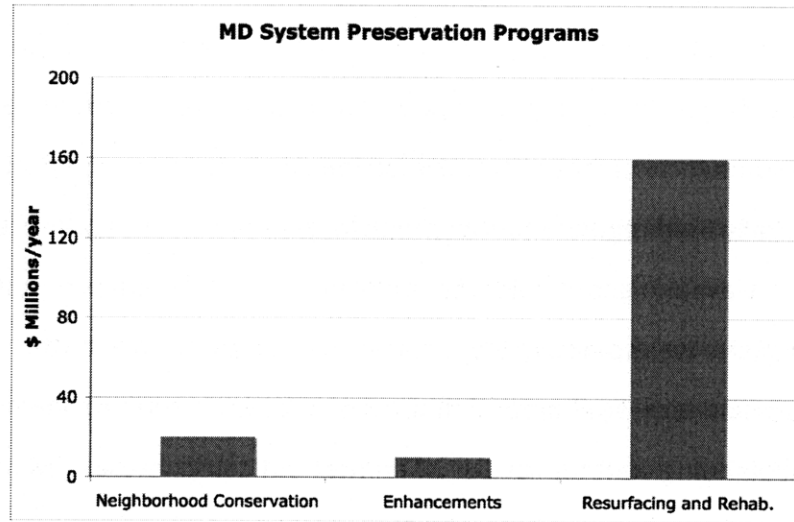


(Maze 2008). Some of these programs are managed at the state level, where projects across the state compete for allocated program funds, and others are managed by the district offices, with district allocations determined as part of the annual budgeting process.

The large number of specific purpose funds is designed to transfer MSHA's policy priorities into project spending. For example, by allocating a particular funding level to the sidewalk retrofit program, senior management can be relatively certain that a target amount of sidewalk will be added to MSHA facilities in a particular year. If these funds were lumped into a broader funding program, they may be expended for other purposes. State transportation officials from across the country agreed that this is a useful tactic for guaranteeing that specific priorities are achieved (Maze 2008). Resources from multiple sources are often combined to accomplish multiple goals on particular projects; however, this requires significant coordination because each program has distinct criteria and may be managed by a different staff person. Projects for each fund may be selected at the district level, as for Resurfacing projects, or based on statewide competition, as for Neighborhood Conservation.

The Resurfacing and Reconstruction fund generally receives the largest share of system preservation funds, and was funded at \$160 million in 2008. The Neighborhood Conservation fund is a statewide program designed to accommodate the complex needs in urban corridors. The Sidewalk and Bicycle Retrofit programs were funded at \$2 million and \$1 million respectively in 2008. Each category receives funding based on historical allocations and an assessment of future needs.

Figure 6.2 MSHA Selected Preservation Program Funding, 2006



6.4.1 Resurfacing and Rehabilitation Fund

In 2007, SHA improved 1,950 lane miles of pavement including 714 miles through resurfacing and 1,236 through maintenance treatments. Project budgets vary from about \$50,000 up to about \$10 million dollars. Most resurfacing treatments are designed to add 5 to 15 years of life to the pavement.

MSHA's pavements management system models roadway condition in the state based on yearly condition assessments and cost estimates, and is used to justify the budget for the Resurfacing fund and to help select Resurfacing projects. The district offices have discretion in selection of resurfacing projects based on perceived local needs and conditions, but are guided by the management system. Staff throughout MSHA agreed that while the management system is a helpful tool for project selection, professional judgment and discretion are essential.

Once projects are selected, engineers working in the district offices develop design and maintenance of traffic plans. Design plans are reviewed at 30%, 60%, and 90% completion. Local public works staff are generally involved in these design reviews, and

all design plans must be approved by MSHA's Office of Highway Development. Local planners are sometimes involved in design review as well.

Both MSHA staff and local staff reported a good communication regarding resurfacing projects, though some local planners noted occasional lapses of communication. MSHA district staff generally hold regular meetings with local public works staff at least every three months to review and coordinate upcoming projects and plans. Coordination with local planning agencies was somewhat less common, though, in each of the three districts both state and local staff agreed that MSHA was willing to provide design drawings to local planning staff for review when they indicated interest. MSHA district engineers also send 30 percent and 90 percent design plans to local staff for review. While there is no formal mechanism requiring this review, or requiring MSHA staff to modify design plans based on local review, MSHA district staff seems committed to addressing local review issues. Frequent informal communication and respectful working relationships between the MSHA district engineers, local departments of public works and utility providers, were frequently raised as one of the most important elements of good resurfacing project outcomes. Coordination with local staff tends to focus on coordinating maintenance-of-traffic, utility work, and emergency services rather than design. MSHA staff frequently work with Homeowners Associations and business associations on the development of maintenance of traffic plans for resurfacing projects; however, design review is not generally part of this process. Local staff and homeowners associations generally accept the boundaries MSHA places on Resurfacing projects and seek other avenues for achieving desired transformations and design changes.

Most resurfacing project designs are essentially identical to pre-existing conditions, with the addition of ADA compliant pedestrian ramps at intersections. The funds allocated to the resurfacing program are based on cost estimates for pavement improvements. MSHA requires that pedestrian ramps compliant with the Americans with Disabilities Act

be provided at all crosswalks as part of resurfacing projects, but other improvements are generally not funded with Resurfacing program funds. Occasionally lane widths are altered slightly to create a wider shoulder for bicycle traffic. Innovative practices tend to be related to materials and maintenance-of-traffic, rather than geometric, operational or user design innovations. With more projects than funds, project managers are motivated to not to expend resurfacing funds for other purposes. In the late 1990s, as part of the *Thinking Beyond the Pavement* initiative, MSHA reversed its policy to bring roads that are reconstructed up to current design standards. This policy had led to many road expansions that infringed on pedestrian and landscape zones. Under the new policy, roads are rebuilt within their existing footprint, unless safety or other concerns lead to a new design.

When district staff identify additional needs that should be addressed in conjunction with a resurfacing project they sometimes combine resurfacing funds with other funds, such as the sidewalk and bicycle retrofit funds. This process can be challenging because they often do not manage the other funds, and must apply for funds based on the specific criteria for each fund. Coordinating the timing and requirements for multiple funds adds complication and delay to projects. For example, to obtain funds to build sidewalks the state criteria for sidewalk funds must be met and the state Sidewalk Retrofit program manager must authorize funds and because a local match is required for these funds, the County (or city) must authorize funds as well. In many cases, the districts manage area wide paving contracts because these can save about 20% compared to individual project contracts and allow more flexibility in responding quickly to preservation and maintenance needs. Contractor specificity adds another incentive to keep contract simple (R. Yurek personal communication March 23, 2009).

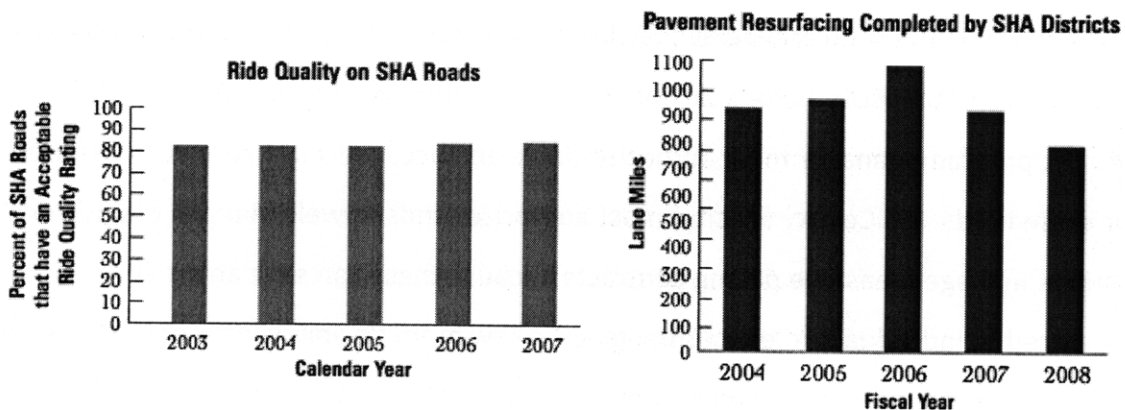
Staff in each of the three districts agreed that in most cases, there is little to be gained by coordinating sidewalk and other improvements beyond the curb with resurfacing. There are minimal cost-savings because of contractor specificity and there are added

administrative costs. In one case district staff noted that there may be some cost savings related to combining maintenance of traffic plans and equipment, but in general MSHA staff focused on agency costs rather than user costs.

In some cases when the function of a road is agreed to be of local, rather than state significance, a resurfacing project may be tied to plans to transfer ownership to the local government. This generally occurs after the state has built a bypass road that allows an older state route to become a local route. When this results in major changes to the function, a Neighborhood Conservation project is sometimes used to incorporate a broader array of issues, as in the Odenton example.

In 1994, Maryland's roads were in slightly worse condition than the national average. By 2001 they were in slightly better condition than the national average.² The pavement management system, and the approach to Resurfacing projects has helped MSHA maintain road condition close to its targeted goal for several years, as shown below.

Figure 6.3 MSHA Pavement Condition



Source: 2008 Annual Report

The Resurfacing program represents the largest commitment of MSHA system preservation funds and covers most paved infrastructure, but these projects generally

² Surface Transportation Policy Program. *Roadway Condition Decoder*. 2002.

do little to advance local plans and priorities. The communication that is happening as part of these projects is ensuring that they do not work against local plans, however. In 2004, the General Assembly granted MSHA \$237 million of additional revenue for this fund based on projections developed with the MSHA's pavement management system.

Although there is little incentive to do so, district staff do combine funds. Resurfacing and Bridge Rehabilitation funds are frequently combined because cost savings are achieved by creating a larger resurfacing area. Spot Safety funds are often used to combine Resurfacing with intersection improvements.

Although the design approach to Resurfacing projects does not really reflect context-sensitive design or *Thinking Beyond the Pavement (TBTP)*; the organizational culture associated with *TBTP* seems to have created better communication between state and local staff. Many state and local staff noted that in recent years they have begun to work more cooperatively with local staff. The improved communication has resulted in better maintenance of traffic and better coordination with utility work.

Several of the staff I interviewed mentioned the disincentive to select urban projects for this fund. Urban projects tend to be more complex and thus more costly. Because performance measures and cost-estimates are focused on lane-miles completed, these projects can reflect badly on the districts.

6.4.2 Neighborhood Conservation Program

The Neighborhood Conservation program (renamed the Community Safety and Enhancements program) was developed in 1996 in support of the state's Smart Growth initiative to use transportation funds to stimulate growth and investment in established neighborhoods. It is considered the centerpiece of MSHA's Smart Growth program.³

³ Pederson, Neil. SHA Administrator at the Smart Growth and Transportation conference, 2002.

The program aims to enhance areas along state highways, particularly through neighborhoods and urban centers, and to leverage transportation funding for sidewalk construction, drainage, landscaping and streetscaping in order to support local investments in economic development and urban design projects. MSHA staff partner with local communities to develop balanced, holistic projects that respect technical functionality and incorporate the needs and desires of the community as well as the traffic and safety elements vital to an effective State roadway (MSHA Community Safety and Enhancements).

Citizen activists were an important impetus for the Neighborhood Conservation program. East Main Street (MD 170) in Westminster became a pilot project for the program after the Mayor, at the behest of citizens, petitioned MSHA for a new approach to reconstruction. The route needed reconstruction, and the MSHA district engineer proposed design plans according to standard design guidelines that would have widened the roadway, removed more street trees and narrowed the sidewalks. One citizen led the opposition, others joined, and the mayor got involved on their behalf. The mayor was able to convince MSHA to scrap the design plans and begin a new design process that involved a citizen and business task force from the very beginning. In this new process, the task force selected the design consultant and was involved as decision-making partner throughout the design process. Their objectives for revitalization of the downtown were included as core issues in the design (T. Beyard personal communication 27 March 2009). The resulting design maintained the pre-existing road width and improved the pedestrian environment by adding bulb-outs at intersections, mid-block crosswalks, additional street trees, and brick design elements.

To date, nearly 100 projects have been completed under this program and there are approximately fifty awaiting funding (D. German personal communication 23 March 2009). The fund has been very susceptible to budget fluctuations, there have been

seven funding cuts and two complete shut downs in the funds 10 year history. The program was initially funded as part of the system preservation capital budget in 1997 at \$8 million, and funding was tripled to \$21 million in 1998. Due to budget shortfalls and a shift in political power the program was eliminated in 2003. The program was re-instituted in 2007, after another gubernatorial election. Most Neighborhood Conservation projects are budgeted for between \$1 million and \$5 million. Because Neighborhood Conservation projects do not fit clearly into any of the federal funding programs, they often involve primarily state funds and little or no federal funds.

Projects are selected through a statewide competitive application process managed at MSHA's central office. Eligible projects must improve structural or functional elements of the roadway, usually without adding capacity. Projects are selected for funding based on local applications, and are funded in three phases: concept, design and construction. In each phase, projects are selected based on based on technical transportation needs as well as potential to spur economic revitalization; enhance the community's natural and built environment; and demonstrated local support. To be eligible for design funding, all parties must support the design concept and the scope of work generated in the concept phase, and funding must be secured for the design of non-transportation elements (generally utilities). To be eligible for construction funding, all other funding sources must be arranged, right-of-way and easements must be secured, utilities design plans must be completed, and agreements for utility work and maintenance must be signed, the local jurisdiction must demonstrate the ability to acquire additional funds if project costs increase, and a open public meeting presenting the final plans must be held. Priority is given to projects with higher local match rates and for which the local jurisdiction will take over maintenance responsibilities.

During the concept phase MSHA and local communities define the project scope by gathering information, defining the opportunities, creating and choosing alternatives. Central office staff have a much larger role in these projects than they do in resurfacing

projects. District staff are involved in all stages of the projects, but the central office planning staff manage the concept and design phases. Cost-sharing agreements are often arranged to provide amenities that the communities want.

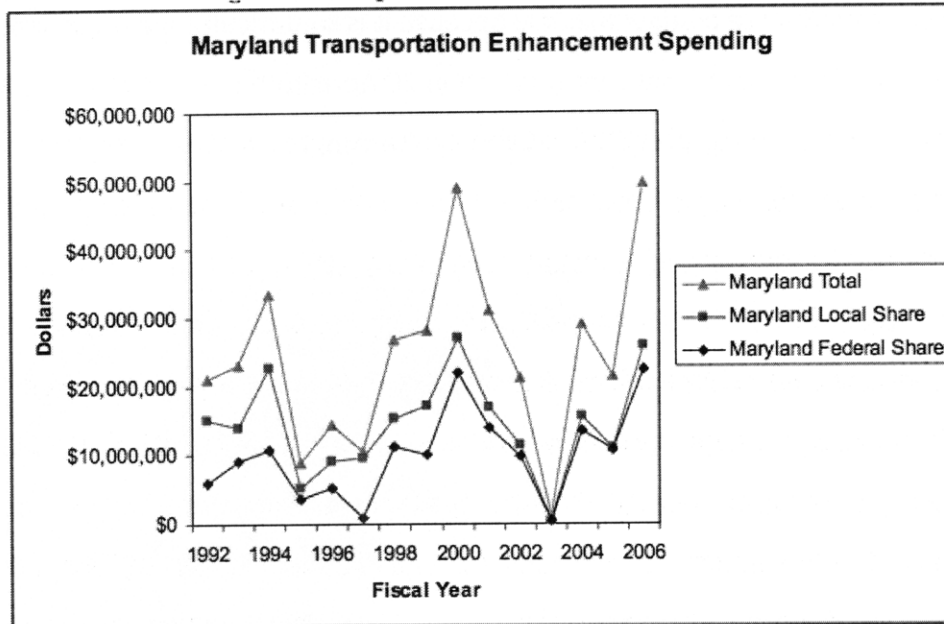
The Neighborhood Conservation program shows the ability for a state transportation agency to implement a program that integrates context-sensitive design principles and community priorities into system preservation. Unlike most MSHA projects, which only address the public right-of-way, Neighborhood Conservation projects include design plans up to the building line on either side of the road. Communities are generally very happy with these projects, and they are points of pride for MSHA staff as well. They incorporate a much broader range of concerns than typical preservation projects, though they do little to address circulation patterns and generally do not prioritize pedestrian or bicycle transportation at the expense of auto-mobility. Local priorities are the impetus for these projects, and local planning must precede MSHA involvement in order to meet the application criteria.

6.4.3 Enhancements Program

The state Enhancements program is a direct response to the federal Enhancements fund, which supports a broad range of community priorities including non-motorized transportation. As with Neighborhood Conservation, local planning that precedes, and creates the motivation for MSHA involvement in Enhancements projects.

On average, about \$40 million dollars has been spent annually on Transportation Enhancements Projects in Maryland in the last ten years, which is well above the national average. Few state dollars are expended on these projects, because local governments are required to provide the local match. The local share of Enhancement project costs in Maryland is about 60 percent, compared to an average of 30 percent nationally. This indicates the level of local commitment to non-motorized transportation in Maryland.

Figure 6.4 Maryland Transportation Enhancement Spending



Source: Knaap G. *10 Years Later*. 2008

The gap in funding shown in FY 2003 occurred concurrent with a gap in federal funding when TEA-21 expired.

6.5 Local Review of System Preservation Projects

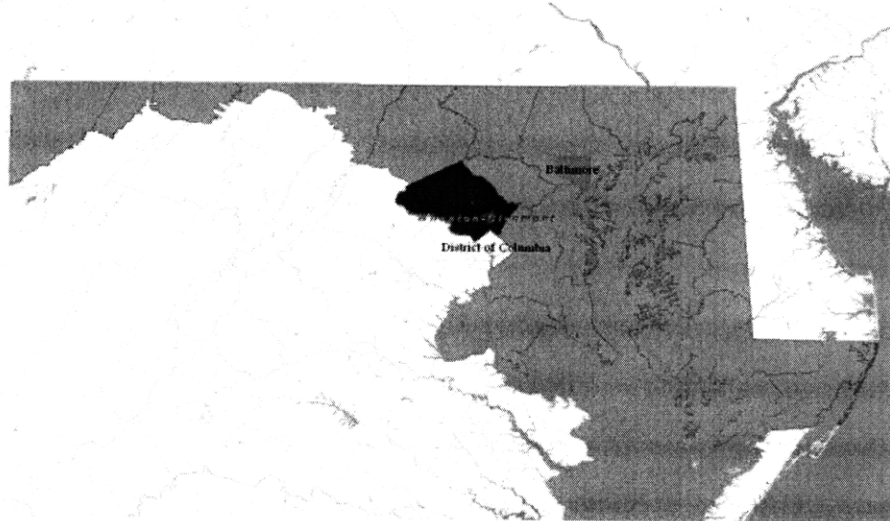
6.5.1 Wheaton-Kensington

The Wheaton-Kensington planning area encompasses about 10.5 square miles just outside the Washington Beltway in Montgomery County. The population of the area is about 75,000, and is forecast to grow to about 90,000 by 2030. There are over 20,000 jobs in the area as well. Some infill development is forecast, but most development is forecast to occur in higher density developments in the town centers.

The Washington Metro was extended to Wheaton in 1990. There is a MARC commuter rail station in the town center of Kensington. The area is served by the Washington

Metro and Washington Metropolitan Area Transit Authority (WMATA) regional bus service and Montgomery County (RideOn) local bus service. The major roads through downtown Wheaton are a huge obstacle because it is so difficult for pedestrians to cross them safely (S. Tallant personal communication 20 April 2009).

Figure 6.5 Wheaton-Kensington Area



The Maryland National Capital Park and Planning Commission (MNCPPC) performs planning functions in Montgomery County and neighboring Prince George's County. MNCPPC mission is to manage growth, steward the environment and provide recreation activities. The agency works with local citizens and stakeholders, but does not act as an agent of local citizens. The Planning Board of Montgomery County is appointed by the County Council and approved by the County Executive. MNCPPC, the County Public Works department, and the Planning Board are involved in reviewing MSHA projects in the County.

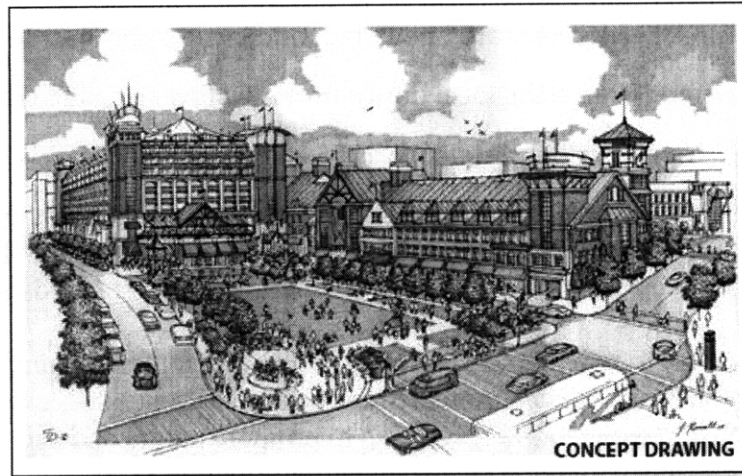
Plans and Priorities

The Wheaton-Kensington area has been a locally designated growth area since the 1969 Montgomery County General Plan was adopted. Wheaton and Kensington each have a distinct central business district guided by a sector development plan, but the surrounding neighborhoods are part of a combined master planning area in

Montgomery County. The most recent Kensington-Wheaton Area Master Plan was adopted in 1978. Since then, sector area plans have been developed for each of the town centers to provide more specific guidance. Both sector plans are currently undergoing updates. Additionally, the Georgia Avenue Concept Study and pedestrian and bicycle master plans have addressed priorities and development goals for the area.

Recent plans for the area show growing commitment to sustainability and reduced reliance on vehicular travel. Though accommodation of vehicular traffic is still recognized as an important priority. Pedestrian safety is a key issue in the area. The MDOT funded a pedestrian safety study for the Wheaton central business district in 2003, which has provided the basis for public and private investments. Kensington Council members have proposed a new pedestrian underpass to respond to pedestrian safety concerns. The

Wheaton Redevelopment Authority works with a local advisory committee to support and advocate for public and private investment that will help build their vision.



The Kensington-Wheaton communities are interested in

Image Source: wheatonmd.org

calming traffic on the major routes through downtown Wheaton into boulevard streets that will be more attractive and more compatible with pedestrian activity (S. Tallant personal communication 20 April 2009). There is some tension between the need to move traffic through the county, and the Smart Growth vision of dense, walkable transit-oriented centers.

Montgomery County's Transportation Review policy sets various levels of tolerable congestion in different areas of the County, based on existing and desired development patterns. The Wheaton-Kensington area allows the second highest (out of nine) level of congestion. Rather than require added road capacity as a condition of development approval when this level of congestion is exceeded, Montgomery County's policy encourages the County and State transportation agencies to develop recommendations for trip reduction and alternative mode enhancements in addition to traditional capacity improvements. Approval authority for these decisions is left to the elected Planning Board, however.

Last year MNCPPC proposed legislation for adoption by the Maryland General Assembly that would have provided stricter requirements for pedestrian and bicycle facilities associated with state expenditures, and would have added a representative from MNCPPC to the state pedestrian and bicycle committee. The legislation did not pass, but demonstrates the local desire for new approaches to transportation.

Montgomery County General Plan: updated in 1993, the General Plan reaffirmed Wheaton-Kensington as a growth area and encourages alternatives to single-occupant vehicles and a refined focus on environmental stewardship.

Georgia Avenue Design Study: The Montgomery County Council is currently reviewing a Concept Study completed for Georgia Avenue, which runs through Wheaton. The vision for Georgia Avenue is to promote public and private development along the corridor grounded in sustainability principles. The study recommends that any reconstruction of Georgia Avenue should consider reducing hardscape and curbing, encouraging energy efficiency and integrating energy production into the right-of-way.

Kensington Area Sector Plan: An update to the 1978 Kensington Area Plan is currently being developed. The preliminary recommendations are focused on mixing residential and commercial uses, enlivening pedestrian areas, promoting sustainable revitalization, and using roadway design initiatives and road network improvements to enhance connections between neighborhoods and the Town Center.

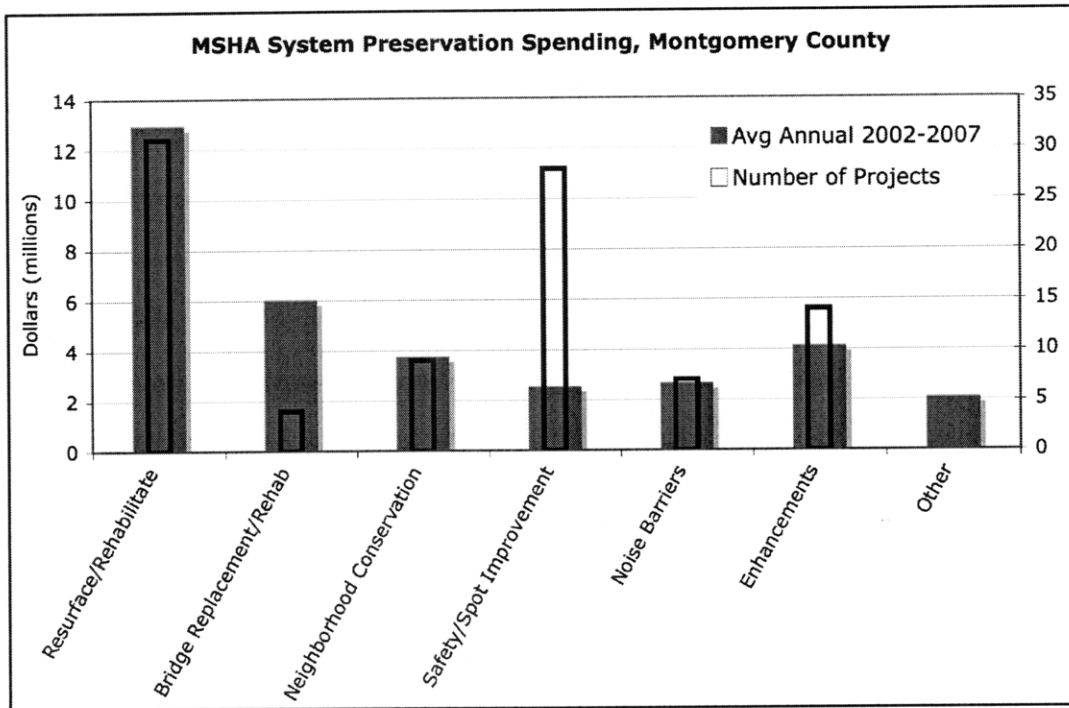
Wheaton Central Business District Sector Plan: The Wheaton Area Sector Plan supports a "balanced and coordinated network of transportation facilities". It does not favor any particular mode, but rather tries to accommodate all modes by including plans to improve the pedestrian experience, encourage transit use, and maintain automobile traffic flow. By

analyzing and making recommendations for each mode of transportation separately, the plan avoids addressing conflicts between modes. An update to the Sector Plan is currently being developed, a pedestrian safety is a central issue.

MSHA Investments in Wheaton-Kensington

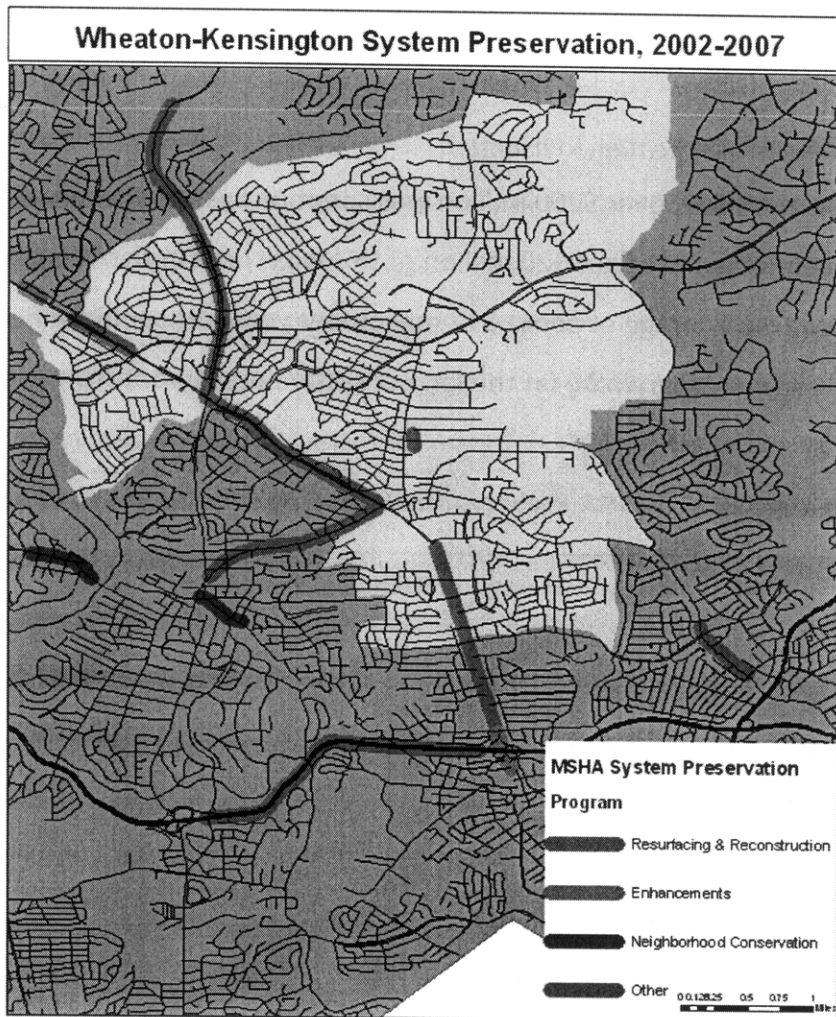
Between 2002 and 2007, over \$200 million was spent on System Preservation in Montgomery County, and about \$20 million of this was spent in the Wheaton-Kensington area. An average of about \$12 million per year was spent on Resurfacing projects, making this program by far the largest system preservation program in the County.

Figure 6.6 MSHA Preservation Spending, Montgomery County



Data Source: Maryland Consolidated Transportation Plan, 2002 and 2005

Figure 6.7 MSHA Preservation Spending, Wheaton-Kensington 2002-2007



Similarly in the Wheaton-Kensington area, more than 40 percent of the system preservation expenditures were for Resurfacing projects, about 35 percent for Enhancements, 10 percent for Noise Barriers, and 10 percent for a Neighborhood Conservation project. The geographic distribution of the projects is shown in the figure above.

In 2002 MSHA completed a \$1.3 million Neighborhood Conservation project on Strathmore Avenue in Kensington. This project was locally initiated based on desired sidewalk, lighting and aesthetic improvements near the MARC train station. MSHA district and highway development staff worked with the Town of Kensington, local

renters, owners, and businesses throughout the concept and design. MSHA staff relied on local staff to organize a local task force and resolve disputes between local stakeholders. The Mayor of Kensington was actively involved working with adjacent property owners to reach agreements for design. MSHA has final decision-making authority, but because the project was initiated locally, rather than by MSHA, and because the program is designed to provide community enhancements, MSHA expects consensus from the local community. Local staff and stakeholders are motivated to reach agreement because Neighborhood Conservation funds are competitive funds, and MSHA can walk away from the project if agreement can not be reached. MSHA staff set boundaries on the use of the state funds, for example, they approved using some of the project money to replace the fence along an adjacent lumberyard where new sidewalk was being added, but were unwilling to take on some of the utility costs for that property. MSHA does not buy right-of-way with Neighborhood Conservation funds. In this case, easement and dedication agreements had to be negotiated to gain the right-of-way needed for the sidewalk. This gives adjacent property owners power in the process and provides more motivation for consensus decision-making.

A pedestrian tunnel under the Capitol Beltway along the east side of Georgia Avenue was constructed through the Enhancements program in 2004. The project was identified in the 1998 Forest Glen Sector Plan, completed by MNCPPC. The Planning Board and County Council approved funding for the local contribution after MNCPPC completed a demand study that showed a limited amount of latent pedestrian demand and citizens associations expressed support for the project. The County applied to MSHA for funds through the Enhancements program, which is managed statewide, rather than at the district level, and MSHA accepted the project. The County Department of Public Works led the project design, and MSHA Office of Highway Development staff reviewed design plans for compliance with clearance standards, ADA, and safety considerations. Aesthetic treatments were left to the County's discretion. MSHA retained design approval authority because the project impacts facilities owned by MSHA, but in many

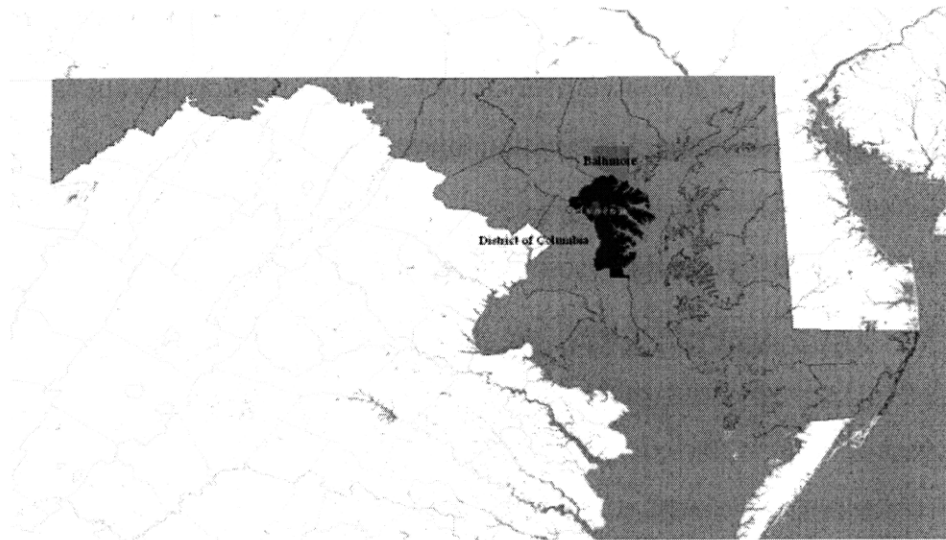
ways MSHA staff consider this a “County project”. MSHA district staff had little involvement in this project. The MSHA funds were reimbursed through the federal Enhancements program, so no state funds were actually expended on the project.

The Resurfacing projects were selected by the MSHA district office using the pavement management tool. The projects incorporated no significant design changes other than the mandatory ADA ramps as crosswalks. MNCPPC planners reviewed design plans and provided comments related to pedestrian, bicycle and transit accommodation consistent with local plans. Local planners noted variability in MSHA Resurfacing designs. Some design plans incorporate appropriate accommodation for alternative modes from the very beginning, and other times these elements are completely left out. Design review provides opportunities for raising these issues and reaching a more consistent level of design. Although MSHA designers are not required to incorporate comments from MNCPPC, County staff, the Planning Board, or public stakeholders, they often do so, particularly when the comments are supported by state and county policies and can be incorporated at little additional cost. Local staff reported the MSHA designers are generally straight-forward in addressing local design review; they either incorporate the changes or explain why they are not doing so. A MNCPPC transportation planner noted that the Wheaton Pedestrian Study has been a useful tool for achieving better pedestrian amenities when MSHA does work in the Wheaton central business district.

6.5.2 Odenton, Maryland

Odenton is a developing area near the Fort Meade military base located between Baltimore and Washington D.C. in Anne Arundel county. Odenton is served by the MARC commuter rail, and has the second highest number of commuter rail boardings in the state. Odenton is a fairly wealthy community with a population of about 20,000.

Figure 6.8 Odenton Area



Odenton Plans and Priorities

Plans for Odenton to develop around a transit-oriented town center date back to 1968. The area is currently planned under the 2004 Odenton Small Area Plan.

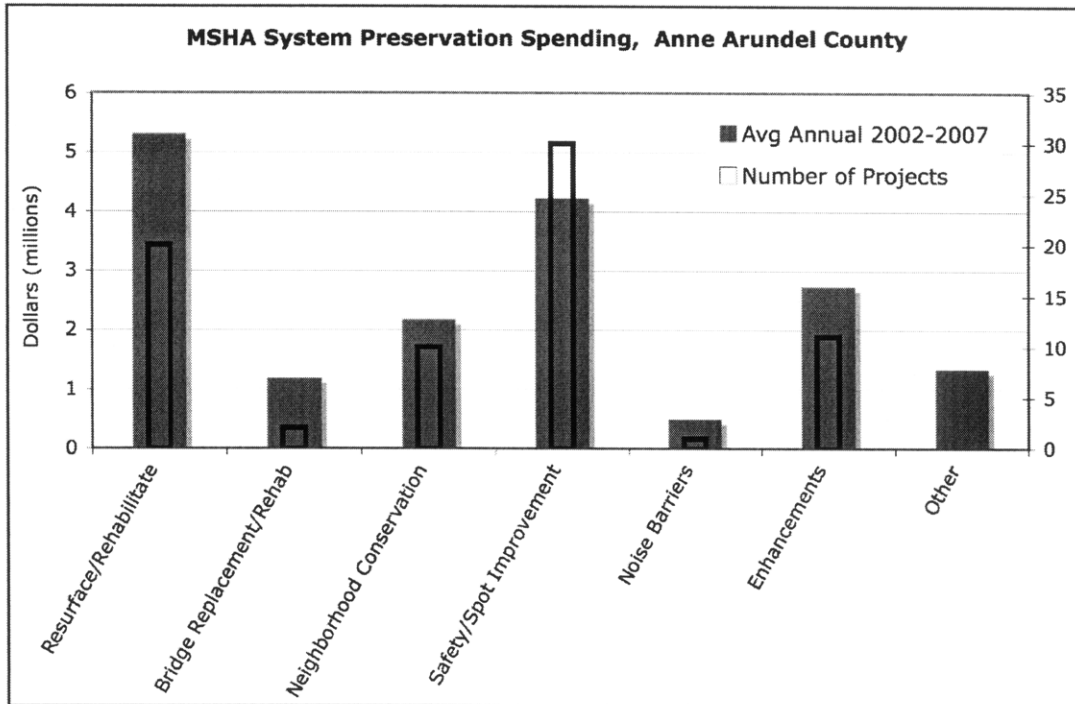
The Odenton Small Area Plan was developed by an appointed task force and Anne Arundel County staff, with public and local business input solicited at two public forums, many community events, and a business focus group. Improving pedestrian and bicycle networks, both for commuting and recreation are themes throughout the Plan. The Plan also seeks to preserve and enhance the “Community Main Street” environment in Odenton by implementing the MD 175 Streetscape Plan (Odenton 2004).

While there is broad support for transit-oriented development, improved walking and biking facilities, and reducing through-traffic on MD 175, Odenton stakeholders are also concerned that roadway facilities continue to provide good vehicular flow (M. Fox personal communication, 31 March 2009).

MSHA Investments in Odenton

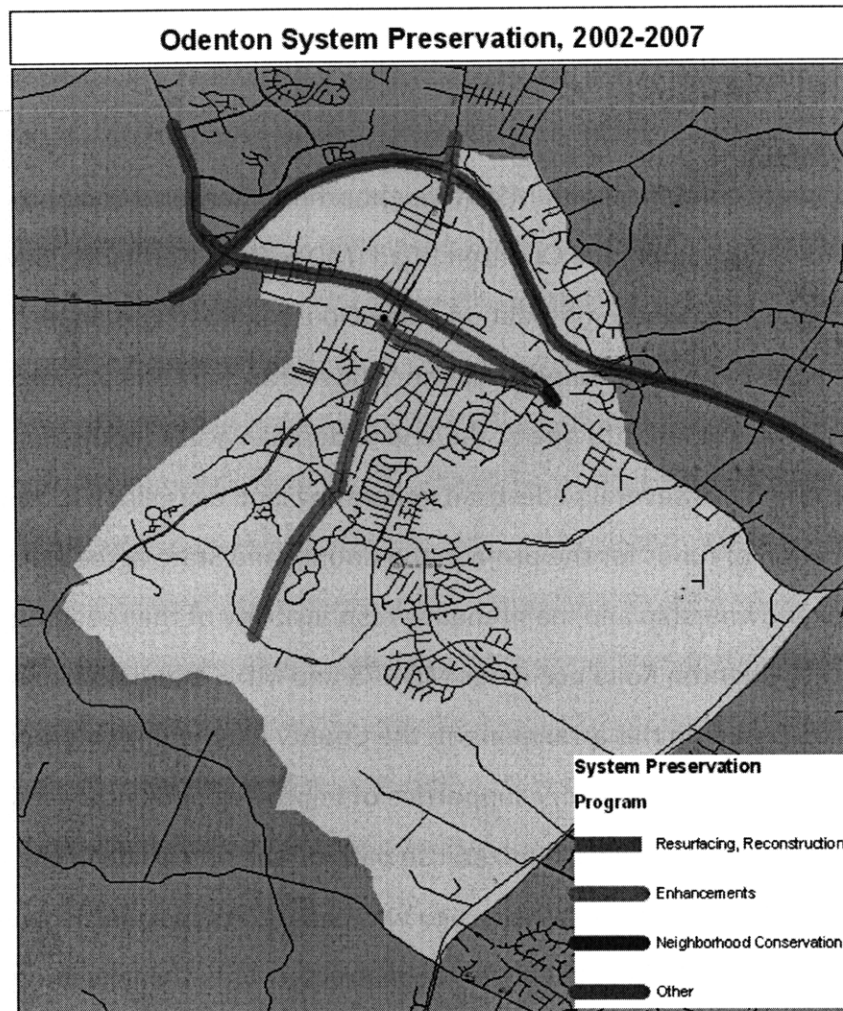
About \$105 million was spent on System Preservation projects in Anne Arundel County, including about \$7.7 million in Odenton between 2002 and 2007. Resurfacing projects are the largest category of system preservation funding in the County, but represented less than 15 percent of system preservation funds in Odenton.

Figure 6.9 MSHA System Preservation, Anne Arundel County



In the Odenton area during this period, two Neighborhood Conservation projects made up the largest portion of preservation funding, followed by Safety Spot Improvements, Enhancements, and Traffic Management. In part, this shows the cyclical nature of system preservation investments. Resurfacing represents the largest fund when averaged over larger areas, but in specific locations, these funds come in bursts of investment on 5 to 15 year cycles.

Figure 6.10 MSHA System Preservation, Odenton 2002-2007



MSHA constructed a roundabout at the intersection of MD 175 and Odenton Road using Neighborhood Conservation funds. The roundabout concept was developed as part of a local streetscape plan developed in 1999. This plan included a variety of modifications throughout the Odenton town center area. The County decided to break the plan into phases and applied to MSHA for Neighborhood Conservation funds for the roundabout portion. Local businesses and residents supported the plan, though some drivers were concerned about the traffic impacts of a roundabout. MSHA was receptive to traffic calming concepts for MD 175 because MD 32 was a higher-grade facility that could serve as a parallel through-route. MSHA district staff designed the roundabout and presented concepts to local stakeholders at several public meetings. There was no

project task force for the roundabout, though MSHA revised the design concept to include lighting and sidewalk elements based on local review comments. MSHA funds did not pay for these elements, however.

County funds were combined with MSHA Neighborhood Conservation and Enhancements funds to upgrade Odenton Road (MD 677) and provide sidewalks along it. Pedestrian and bicycle accommodation along Odenton Road was a high priority for the County because the road connects to the WB&A Trail, part of a planned national network of rail trails; it leads to one of the few pedestrian access points for the MARC train station; and it has several pedestrian generating land uses along it. As part of MSHA's allocation of funds for the project, the County and State agreed that the County would take over ownership and maintenance responsibility of the road after the project was completed. Odenton Road pre-dates MD 175 and MD 32, and no longer carries regional traffic. Based on this arrangement, the County led the design process. Local businesses and residents were very supportive of improving pedestrian and bike access. The first design concept involved a mixed-use path on the north side of the road, but based on stakeholder comments, the design was changed to include sidewalks on both sides of the road. The roadway itself was reconstructed with drainage improvements and minor realignment, and lighting was added along it as well. MSHA reviewed the design plans and retained approval authority near the intersections with other state-owned roadways.

The County initiated these projects by requesting sidewalks along Old Odenton Road, and suggesting a roundabout as a gateway to Odenton Town Center in their Master Plan. Enhancements funds were coupled with the Neighborhood Conservation project to provide sidewalks along the road and drainage improvements along the road. Old Odenton Road was turned over to the County as part of this project, so the County assumed management responsibility for the design and construction, and MSHA district staff were involved in a review capacity primarily to raise safety and operational

concerns near the intersections with state roads MD 175 and Piney Branch Road. MSHA staff had leadership and decision-making roles in the roundabout project. Two public meetings were held for this project, and district staff took comments from the public, the planning board, and local staff. It is up to the discretion of the MSHA staff to incorporate the comments, but generally if the comments can be incorporated with little additional cost and they do not interfere with safety or operational issues, MSHA will include them in design revisions. The local staff comments for the roundabout primarily related to sidewalks, lighting, and signage. The County wanted to ensure that the roundabout provided an appropriate gateway to the town center. Because the local plan was the impetus for the project, and because two legs of the intersection are County roads, the district staff incorporated these comments into the final design.

Shortly after the Odenton Road project was completed, another Enhancements project funded the construction a 2.7-mile segment of multiuse path that was a gap in the WB&A Trail system. This project was identified in the Odenton Master Plan, and the County requested enhancements funds to leverage federal funds for the project. Design for the project was managed through the MSHA Office of Highway Development, in cooperation with local staff.

A section of MD 175 was resurfaced during this timeframe. The project did not involve pedestrian, bike or transit amenities, though these were part of the Odenton Streetscape Study. Other significant System Preservation expenditures in the area included a new traffic signal system for a section of MD 175 and improvements to the median of MD 32 to address safety concerns. The programs that funded these improvements are not designed to encourage design creativity or to provide community enhancements, and so even though there were plans describing desired changes, local and state staff did not push to incorporate these elements into these projects.

CHAPTER 7: FINDINGS AND RECOMMENDATIONS

7.1 Findings Summary

Overall, I find that transportation planning innovations related to acknowledging transportation linkages to other policy goals; incorporating meaningful public involvement; and providing for flexibility in transportation planning and design have affected roadway preservation in limited ways at the Maryland State Highway Administration. Given that MSHA is a progressive leader among national state highway agencies, and given the shared federal regulations that direct all state highway agencies, it is likely that many state highway agencies have done even less to incorporate these innovations into roadway preservation. Local and regional planners, active citizens, state highway agencies, and federal transportation policy makers each have a role in incorporating these innovations and developing new innovations into roadway preservation in order to advance public priorities for sustainable development and reduced auto-dependence.

The use of roadway preservation investments to advance public priorities highlights a long-standing divide in the transportation field. There are two fundamental interpretations of the core mission of transportation agencies. In one interpretation, the mission of transportation agencies: to provide a safe, efficient transportation system; and to enhance quality-of-life by providing essential mobility. The apparently slight difference in the two interpretations leads to very different priorities for transportation investment. In the first, the condition and efficiency of the transportation system is considered in isolation, while in the second, the transportation system is only valuable in its ability to promote quality-of-life. While most transportation agencies (including US DOT, FHWA, and MSHA) have changed their official mission statements to reflect the second interpretation, the first is still reflected in the institutional behavior. The sentiment that community enhancement objectives are less important than vehicular

mobility remains. Currently, Asset Management decision-making has not been adapted to the second interpretation.

The rational planning approach to transportation decision-making that dominated during the interstate era was focused on cost-efficient optimization of highway systems based on driver mobility with little regard for impacts or related priorities. In the last forty years, transportation planning has undergone a gradual transition toward a more open and transparent balance between land use, environmental, and social systems in which driver mobility is just one of many interests to be weighed. Yet the Asset Management-based model of transportation investment, as it is currently being implemented, largely ignores these considerations. Occasionally, agency staff act creatively to incorporate broader objectives (for example, by combining sidewalk funds with resurfacing funds), but the current program structure creates disincentives to do so.

Although MSHA's mission is to provide a highway system that, enhances Maryland's communities, economy and environment, MSHA's performance measures emphasize traffic flow and safety. Some performance measures evaluate environmental impacts, but community and economic impacts, which are difficult to quantify are not measured. While agency leadership and training emphasize the agency's broader mission, program evaluation is based on the simpler, easily quantified measures. The tendency to rely on elements of performance that are easy to measure, as evident in MSHA's performance measurement program, threaten to undermine the transportation agencies' commitments to enhancing quality of life and context-sensitive design.

The growing support for Asset Management driven programming and performance measurement threaten to further reduce the community enhancement focus of transportation spending. Cost efficient management of roadways, and more generally, transportation assets is a complex task that is essential for assuring public safety and

supporting economic activity. Asset Management tools are very valuable for helping agencies manage risk and costs associated with the deterioration of transportation assets. Yet, Asset Management models are necessarily limited in their scope. They are based on uniform value assumptions, they cannot account for qualitative objectives, and they generally do not incorporate sustainability or environmental objectives. The need for efficient management of public funds is an important consideration, but it should not be the only consideration. Increasing reliance on quantitative tools and measures, such as Asset Management, must be balanced with discretion and flexibility to ensure that broader public priorities are not lost in the quest for efficiency.

7.2 Noteworthy Policies and Practices

7.2.1 *Federal Policies*

Since the 1970s federal policy has responded to shifting priorities related to transportation. The federal transportation role has changed dramatically from the 1940s when the Bureau of Public Roads provided specific direction for the expedient construction of a national infrastructure system to the current US DOT, which oversees all modes of transportation and includes current and future quality of life as part of its core mission. Federal policy has moved away from dictating national values and standards in favor of flexibility to support local values. The broadened understanding of the role of transportation has led to a wide range of federal transportation programs, ranging from funds that can only be used to increase roadway capacity to the enhancement fund, which can be used for multiuse paths and transportation museums. Allowing the use of federal funds for roadway preservation and requiring condition reporting have helped improve state and local commitments to preservation. Federal policy has made impressive progress in broadening the use of transportation funds, but with over two hundred federal funding programs, it has done so through narrow funding silos rather than policies for broader project scoping.

7.2.2 *MSHA Policies and Practices*

MSHA's extensive efforts over the last decade to create an organizational culture that approaches every project with a *Thinking Beyond the Pavement* (TBTP) mentality

demonstrate commitment to building roads that meet community needs. While the Neighborhood Conservation fund illustrates this commitment, the Resurfacing and Rehabilitation fund is focused almost exclusively on cost-efficiency and the program structure discourages a creative and collaborative approach to design. Despite the narrow project scope for Resurfacing projects, commitment to *TBTP* and experience with stalled projects have led to more open communication between MSHA staff, local staff, and citizen groups during project development. Though this communication generally does not result in significant design changes because of the limitations on the program funds, it does help to ensure that the MSHA projects do not conflict with local plans or projects. For example, local staff review ensured that space for a future transitway was retained within the right-of-way along Georgia Avenue when MSHA was upgrading signals and making safety improvements. Additionally, MSHA's policy to rebuild roads within their pre-existing footprint recognizes that bringing a road into compliance with current design standards is not always desirable and it should not be assumed to be necessary.

Neighborhood Conservation and Enhancements projects are part of MSHA's System Preservation budget, but these programs are very different from the Resurfacing and Rehabilitation program. The impetus for these projects is local, and they have little to do with Asset Management or roadway condition. The design approach to these projects is collaborative, and MSHA works with local leaders to seek consensus among the stakeholders. Because MSHA has few agency objectives for these projects, staff maintain their professional obligation to ensure safe, functional design, but are willing to accommodate local design requests as long as there is adequate funding. The Enhancements program is a direct response to the federal Enhancements program. Most of the funds are local or federal, and so, while MSHA staff may manage these contracts they are locally led.

Like MSHA, many state transportation agencies allocate funds through fairly specific funding programs to try to retain targeted levels of investment in particular priorities (Maze 2008). This tactic gives senior management a high level of control over spending within the agency, but it also creates challenges for achieving flexible and multi-function project delivery. Both state and local staff approach Resurfacing projects with different expectations and attitude than Neighborhood Conservation and Enhancements projects. There are two concerns related to this. First, the commitment of state funds to the community enhancements funds is smaller and less stable than the commitment to the cost-efficiency programs. Second, by creating these two types of programs, MSHA is perpetuating the interstate-era sole focus on cost-efficient auto-mobility in certain areas of the agency.

7.2.4 Local Policies and Practices

The impetus for transformation of transportation systems currently comes primarily from the local level. Community members and local staff are most attuned to the impacts of noisy, high-speed, high-volume roadways on community quality-of-life. Even when there is general support for traffic calming, and increasing use of alternative transportation modes, there is often dissension over specific projects that involve particular trade-offs.

For example, while Wheaton residents and businesses support traffic calming and improving pedestrian safety and accessibility, there is resistance to providing protected pedestrian crossings that result in more delay for automobile traffic. MSHA relies on local staff and community members lead these discussions and decisions for roadway preservation projects.

Local planning and public works staff influence state project designs by actively reviewing and commenting on design plans. Because of local staff familiarity with plans and needs, and because the expertise of particular state highway designers varies, this review process adds value to preservation design, even when it results in only minor design changes.

7.3 Recommendations

As system preservation continues to demand a significant portion of public transportation investment throughout the country, transportation agencies should be thoughtful and explicit about balancing growing needs for efficient transportation system preservation; sustainable development patterns; and responsiveness to local values and contexts.

Transportation policy should continue to support preservation because a safe and efficient transportation system is a national priority, but system preservation should not be excluded from the lessons learned and the innovations developed over the last forty years. Given the trajectory of transportation planning and public values related to transportation, preservation investments should be evaluated both on the basis of cost efficiency, as well as on the basis of contributing to long-term transportation needs. Discretion, flexibility and transparency should be allowed to encourage innovative approaches to balancing efficiency and creativity in roadway preservation.

Asset management tools serve a particular purpose, and should be developed to help agencies manage roadway systems, but asset management based decision-making should be supplemented with transparent communication about the impacts of preservation that asset management cannot address. I recommend supplementing the decision-making process for preservation investments as summarized in the table below, in order to achieve a productive blending of cost-efficiency based investment and enhancements-based investment. More detail on each of these recommendations is provided in the following sections.

Table 7.1 Recommendations for Supplementing Preservation Decisions

	Federal	State	Local
Local Preservation Planning: Small area plans that identify expected levels of funding for transportation (including preservation and other potential sources) over a 5-10 year period and identify desired outcomes	x	x	X
Project Scoping: Supplement scoping with checklists that call attention to opportunities related to preservation investments.		X	x
Incentive Funds: Supplementary funding that can only be used to fund project enhancements associated with preservation investments.	x	X	
Performance Measures: Evaluate preservation projects based on broad agency goals.	x	X	
Creativity: Overcome the prevailing attitude that roads are fixed assets.	x	x	X

X: Lead Role, x: Supplementary Role

7.3.1 Local Preservation Planning

The timeframe and budget of road preservation projects are small enough that the cost and delay of performing a meaningful planning study for each project would be prohibitive. Achieving transformative preservation projects requires actionable plans to be created in advance of specific project opportunities and good communication between state and local staff and stakeholders. Traditional transportation plans tend to focus on major roadway and transit projects. Small area planning, corridor planning, and pedestrian and bicycle planning are becoming more common, and are useful for directing creative preservation projects. Local preservation plans are a logical extension of small area plans that are already done in many urban areas. Asset Management tools could provide useful inputs to these plans, such as location and level of preservation investment expected in the area over a five to ten year timeframe. The preservation plans could then develop desired outcomes given an expected level of funding. This approach would allow greater creativity by studying the local transportation systems,

rather than isolated elements and using several anticipated projects to build toward desired goals.

- Federal Role: Funding and content direction for plans
- State Role: Funding, technical assistance, coordination with local staff and stakeholders to reach actionable plans, encourage local creativity by being receptive and supportive of local planning efforts.
- Local Role: Develop 5-10 year plans. Involve local stakeholders in meaningful discussion and evaluation of potential investment opportunities

7.3.2 Project Scoping

Currently, Asset Management based decision-making proceeds from project selection to design with little consideration to revising or expanding project scope. A combination of two options at this stage could lead to better outcomes. First, state and/or federal policies could be revised to require certain project elements as part of any preservation project. Just as Maryland currently requires ADA compliant pedestrian ramps to be included, ADA compliant sidewalks, bicycle lanes, landscaping or other features could also be required. Another option is to supplement the existing process with a checklist to trigger additional review of the project scope. A checklist for preservation projects selected through Asset Management systems could be used to identify projects that could qualify for additional funding in support of local and state goals. Criteria could include:

- Does the local plan call for changes to transportation patterns?
- Does the facility abut, traverse or impact environmentally sensitive resources or environmental justice communities?
- Is the project in a designated growth area with a growth moratorium due to adequate public facilities issues?
- Is the volume to capacity ratio on the road below a threshold (such as 0.7)?
- Is there transit service within ½ mile?

7.3.3 Incentive Funds

In order to overcome the tendency to neglect transformation opportunities in preservation projects, federal and state transportation agencies should create funding

incentives that will encourage agency staff and stakeholders to modify design of preservation projects consistent with local and state goals. This could be done in two ways.

At the federal level, a higher match rate could be offered for preservation projects that meet criteria such as enhancing accommodation for non-motorized modes; reducing automobile capacity; improving water quality; and/or other criteria consistent with sustainable development goals.

At the state or federal level, one or more funds could be created that would provide qualifying preservation projects with added funds to pay for enhancement features such as sidewalks, bicycle lanes, and improved drainage. Project eligibility for incentive funding should be determined based on criteria related to state and federal policy goals, and consistency with local plans.

7.3.4 Performance Measures

There is growing consensus at the federal level that performance measures should be encouraged to improve accountability in the transportation sector. Effective performance measures could enable a great deal of flexibility in transportation funding, but creating performance measures that measure the things that are truly important is quite difficult. Often, performance measures evaluate the things that are easiest to quantify, rather than the things that are most valuable. More work is needed to develop performance measures for qualitative and process elements of transportation investment.

Agencies should ensure that performance measures give adequate attention to community enhancement objectives by adding measures such as: designing transportation systems to support communities' visions; sustaining human and natural environments; enhancing transportation services to all; ensuring the decision making

process is accessible and fair for all citizens. With more effective performance measures, state agencies could give more discretion to district managers to allocate funds in an efficient and context-sensitive way.

Currently, MSHA evaluates preservation projects only based on their contribution to pavement condition goals. This system reinforces the silo attitude that Resurfacing projects do not need to consider other agency goals such as environmental stewardship or alternative transportation. Simply evaluating all projects based on their contribution to the full set of performance measures, rather than a narrowly targeted subset, would be a valuable first step in realigning incentives for preservation projects to serve a broader function.

7.3.5 Creativity and Demonstration Projects

Local staff and community members should take a more active role in pushing for the transformation of infrastructure. Rather than planning around existing infrastructure and focusing only on opportunities to supplement it, local stakeholders should not accept the narrow boundaries placed on roadway preservation projects. Small area, sector and concept plans are good opportunities to re-vision transportation systems. State and federal transportation agencies have adjusted their practices over the last forty years to avoid imposing value assumptions on local condition. This devolution means that the impetus for change in needs to come from the local level.

The Neighborhood Conservation program is an innovative program designed to accommodate the complex mix of interests surrounding urban roads. The program's value is not cost-efficiency, but rather demonstration. Demonstration projects help consumers decide what they want by showing them what they can have. The high demand for these funds indicates the value of this innovation, yet perhaps because the fund does not impact most political jurisdictions in any budget period, and also due to remaining sentiment that these investments are outside the core mission of the agency, the fund has been susceptible to budget cuts.

The FHWA should sponsor demonstration projects and provide technical assistance to develop and highlight innovative practices in roadway preservation

7.4 Future Research

7.4.1 Transforming Incrementally through Design

This investigation focused on how the policies and procedures for roadway preservation affect opportunities to re-vision and transform transportation systems. Policies and procedures to enable these actions are necessary, but new models of design and planning are also needed. Future research could explore design models for transforming infrastructure incrementally. I talk broadly about the need for creativity and flexibility, without describing design innovations that are appropriate for a variety of urban settings. This is partly because the specific local conditions really dictate design opportunities, and generalizing is difficult, but also because demonstration projects are needed to develop new models. The current state of the practice includes enhancements to existing roads – new sidewalks, bicycle lanes, aesthetic treatments – but more proactive transformation of travel patterns are not common. Examples of the scale of design that are probably appropriate for the preservation scale of investment include transit ready design and re-design based on target speeds, truck routes, and general routing patterns.

7.4.2 Re-authorization

SAFETEA-LU expires this year and Congress will soon enact a new federal-aid highway act. System preservation is expected to be a key focus of the new act. New requirements for performance reporting and the use of asset management systems are expected, as are reductions in the number of funding categories. Future research will be needed to re-evaluate how the new federal regulations shift the ability to achieve flexible and creative preservation projects.

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