

TrendLines

SSCRPC — Advising + Planning + Evaluating + Leading

On The Inside:

- **The Scope of the Transportation Infrastructure Problem:** P. 2.
- **Survey of Nationwide Transportation Network Best Practices:** P. 3.
- **MPO Perceptions of Best Practice Areas' Importance and Likelihood of Implementation:** P. 5.
- **Transportation Infrastructure Cost Reduction Strategies:** P. 6.
- **Improving Transportation System Design:** P. 6.
- **More Efficient Materials and Construction.** P. 9.
- **Improving Management Practices.** P. 11.
- **Practices Involving Public Behaviors.** P. 14.
- **Improved Planning.** P. 16.
- **The Importance of Applying Better Practices.** P. 17.

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THE TOPIC: Transportation Infrastructure — Thinking About Ways to Reduce Costs and Improve System Performance

Over the past two years the Citizens' Efficiency Commission for Sangamon County (CEC) considered ways in which local governments in the county might function more efficiently and effectively. One of the areas that the CEC selected to explore was the infrastructure needs of local communities.

This was considered to be important to the CEC's work as infrastructure costs prove to be some of the most challenging to finance. This is particularly true in the case of providing acceptable and safe streets, roads and bridges, as their costs are exacerbated by the fact that transportation networks across the country are aging, requiring major repairs or even replacement in many cases.

As these costs rise, local jurisdictions find themselves facing mounting capital improvement costs necessary to simply maintain the status quo. In order to maintain or improve the current levels of service within local jurisdictions, ways are being sought to more efficiently use the limited resources available to meet current needs, *and* to encourage system users to adopt behaviors that can result in reduced costs and better system performance.

To that end, the staff of the Springfield-Sangamon County Regional Planning Commission (SSCRPC) began to look for simple yet innovative prac-



tices that communities might adopt to reduce transportation infrastructure costs and improve overall performance.

The SSCRPC recommends that local communities view this *TrendLines* as offering some initial strategies useful in stimulating thinking about the various ways that transportation systems can be improved and infrastructure costs reduced, as well as some examples as to how

these strategies might be applied.

While acknowledging that the cost of existing transportation needs may be far greater than the savings generated by any single practice briefly outlined here, the SSCRPC believes that even small and simple measures can be important in narrowing the ever increasing transportation infrastructure needs gap.

The Scope of the Transportation Infrastructure Problem

The need to improve transportation infrastructure is not simply a local one, and it is one that is growing.

In its *2013 Report Card for America's Infrastructure* (<http://www.infrastructurereportcard.org>), the American Society of Civil Engineers (ASCE) found that over 200 million trips are taken daily across deficient bridges in our country's 102 largest metro regions, and that one in nine of the nation's bridges were rated as structurally deficient. ASCE reports that according to the Federal Highway Administration (FHWA), it would take a \$20.5 billion dollar investment to eliminate the nation's bridge backlog by 2028, requiring federal, state and local governments to increase their investments in bridge repair and replacement by \$8 billion annually to address the existing \$76 billion in bridge needs.

Roads fare no better. According to the ASCE, 42% of America's major urban highways remain congested, costing the economy an estimated \$101 billion in wasted time and fuel. Currently FHWA estimates that \$170 billion in capital investment would be needed *annually* to significantly improve existing system performance.

Illinois simply reflects this situation, with ASCE finding, for example, 2,311 deficient bridges in the state that need replacement or repair. ASCE also reports that 73% of Illinois' roads are in poor or mediocre condition, which results in Illinois motorists needing to spend \$2.4 billion annually in extra vehicle repairs and operating costs. This represents \$292 per year per motorist, which the SSCRPC believes can be seen as a "hidden tax" that Illinois motorists must pay due to the current state of our roadways.

To place this in a local context, in 2007 a taskforce of the Greater Springfield Chamber of Commerce produced its report *Lifelines to the Economy: A Study of Springfield's Infrastructure and Transportation System*, which took a close look at the City of Springfield's infrastructure needs. The Chamber found that Springfield had spent, on average, \$11 million on streets and \$15 million on bridges per year over the preceding few years (*Lifelines*, P. 5). Even so, the Chamber report found an annual shortfall of over \$15.5 million on street and bridge preservation, \$7.1 million on modernization, and \$5.4 million on expansion, for a total annual shortfall of over \$28 million. It is likely that other municipalities in Sangamon County — and throughout the state — experience the same shortfalls in meeting infrastructure needs with the only differences being the order of magnitude of the gap.

In a 2013 survey of Sangamon County residents conducted by the Survey Research Office of the University of Illinois at Springfield (*Sangamon County Citizens Survey*, p. 23), 46.9% of those questioned about the state of infrastructure in the county said that they are most dissatisfied with the maintenance of local roads, while 66.6% said that the most satisfying infrastructure projects in their opinion were those expanding or maintaining highways and interstates. Only 19.6% were dissatisfied with these sorts of projects and 10.4% were neutral. So if the public is dissatisfied with the state of local transportation infrastructure at the same time almost 70% support such projects, why does the financing gap exist? The Chamber study provides a reasonable explanation.

The Chamber report gives two reasons (*Lifelines*, p. 2). First, "taxpayers do not understand or appreciate the cost/revenue squeeze governments face in dealing with infrastructure issues". Second, "taxpayers take infrastructure for granted and do not appreciate the ever increasing investment required to keep it functioning, implement improvements and expand the system."

The Chamber report also notes that local governments in Illinois are hamstrung by legal constraints placed on local governments wishing to address the problem. The authors write:

Those of us in the business community would not be able to operate our businesses profitably under the same constraints we place on our government if:

- The prices we charge for our goods and services were capped by law.
- The level of service and the quality of the product is the result of the revenues available after our prices were capped.

This is not to say the system is bad, because it is not — it is democracy. But it poses special challenges that we must successfully deal with responsibly if we are to have the infrastructure our community needs to grow and prosper while maintaining a safe and comfortable standard of living that we all expect. (*Lifelines*, p.2)

Survey of Nationwide Transportation Network Best Practices

The subject of best practices for transportation is one of the most broadly researched and universally explored topics in planning. As such, and to assist the CEC in its study of infrastructure costs, in May of 2013 the SSCRPC designed and disseminated a non-scientific survey to Metropolitan Planning Organizations (MPOs) across the country in order to gauge efforts in planning and practice to improve transportation efficiency and effectiveness.

The MPOs are a relevant group to query as they are the federally designated organizations, located in identified planning areas with populations of 50,000 or more, charged with transportation planning. For example, the MPO for the Springfield metropolitan planning area is the Springfield Area Transportation Study (SATS), which is staffed by the SSCRPC.

This survey was intended to function as a preliminary effort to collect examples of practices in actual use by allowing MPOs to highlight their work and provide contact information for additional follow-up. It was designed around six core efficiency and effectiveness approaches identified by the CEC as general pathways for implementing improvements. The six approaches range from the least difficult and complex (as they can be implemented by one or just a few jurisdictions, often informally) to the most difficult and complex (as they usually involve more than one jurisdiction or program and typically require some sort of formal agreement.) As described in the CEC's *White Paper for the Citizens' Efficiency Commission: The History and Nature of Joint Service Efforts in Sangamon County* (SSCRPC, April 26, 2012), the CEC's "Six C's" are:

- **Conservation:** Approaches that reduce costs or inputs within a single entity or among individual members of the public, and therefore conserve local resources.
- **Communication:** Efforts intended to share knowledge or information about ways and means to improve government efficiency and effectiveness among multiple entities.
- **Cooperation:** Involves multiple entities working together by interacting through similar processes or means, although they each may be pursuing different ends.
- **Coordination:** Entertains multiple entities working together to pursue the same mission or ends, though they may use different means or processes to do so.
- **Collaboration:** Involves multiple entities working toward the same ends and through the same means, usually by way of a formal agreement.
- **Consolidation:** The formal, institutional combining or merging of two or more departments or governmental entities due to the similarity of their means and ends. This most often requires a formal agreement as it results in an existing entity taking on the work of other entities — with these other entities ceasing to exist following consolidation — or the creation of a new entity which takes on the work of other existing entities — with all of the existing entities ceasing to exist following the creation of the new one.

In order to collect examples of innovative practices for future research in each of these areas, the SSCRPC asked MPOs to answer an open-ended question about the best practices they had observed or implemented in each. The survey also included a series of Likert-type scale questions developed to gauge the perspectives of planners across the nation related to the perceived importance of different transportation planning trends that could increase cost efficiency and system effectiveness.

Among the 295 MPOs nationwide for which the SSCRPC could acquire a seemingly valid email address, only 17 responded to the survey, yielding a response rate just exceeding 5%. The SSCRPC assumes that this low response rate could be the product of dated or invalid email addresses, recipient email filtering, the non-scientific nature of the survey, or recipient unwillingness to participate, rather than an indication that little innovation is occurring at the local level throughout the country.



The Survey (Continued)

As the survey was not intended to be scientific but simply a prologue to further research, the SSCRPC did not find this limited response to be problematic as the responses included telling anecdotes or citations regarding the increased frequency in development or regional plans and relayed the perceived growing importance of regional planning committees and MPOs in addressing infrastructure-related issues.

One of the most detailed responses, for example, described the expansion of the role of a Florida MPO to serve as a regional “hub” for local government joint procurement. One of the efforts of this MPO is highlighted in the sidebar to the right, and represents a valuable best practice in pursuit of the joint procurement efficiency recommended by Sangamon County’s CEC (*Joint Procurement Efforts in Sangamon County Municipalities and Special Districts*, CEC, Feb. 13, 2013).

Also of interest to the SSCRPC were the answers to questions related to the importance and likelihood of innovation in such areas as transportation funding, life-cycle costing, intergovernmental cooperation, system design, and outreach. The charts on the next page of this *TrendLines* provides graphic illustrations of the response distributions for both of the Likert scale questions. The first of these questions asked respondents to rank on a 5-point scale, from “Very Unimportant” to “Very Important” their perception of the importance of pursuing innovation in a series of common best practice areas. The second asked MPOs to describe from “Very Unlikely” to “Very Likely” how they perceived the likelihood of jurisdictions within their planning areas pursuing these best practices.

By comparing the respondents’ perceptions of the *importance* and *likelihood* of pursuing innovation and implementing best practices as related to transportation networks, the SSCRPC developed an interesting — though broad — picture of what some committed planning groups find particularly significant in today’s economic climate. Again, it is important to note that a very limited number of respondents answered these survey items. However, among these respondents, the areas of *Funding Acquisition*, *Intergovernmental Cooperation*, and *Public Outreach* received the most favorable responses in terms of importance, with over 80% of those responding ranking these as “Somewhat Important” or “Very Important.”

Most respondents stated that pursuing innovation in the areas of funding acquisition was “Very Likely” for planning bodies within their area. With 40-55 % of respondents (depending upon item) stating that funding concerns are the primary targets for innovation and best practice implementation, the SSCRPC recognized the need to identify specific methods responsible jurisdictions can use to increase their cost efficiency and encourage transportation behaviors that could lead to cost reductions.

Interestingly, respondents were more willing to express the belief that a best practice was important than they were to indicate that it was likely to be explored in their planning area in innovative ways. Innovation in most topical areas listed had higher percentages of “Very Important” responses than “Very Likely” responses. As follow-up, the SSCRPC became interested in determining the barriers that apparently stand between survey respondents’ desires to implement best practices and their actual implementation. Although the SSCRPC included in the survey an open-ended question to this effect, responses to it were so sparse that it was difficult to glean any useful information or patterns on this matter.

Collectively, the responses gathered through the survey prompted the SSCRPC to conduct further research into the subject of cost effective transportation network best practices and traffic source reduction. As the SSCRPC recognizes that transportation best practice literature is vast and case studies numerous, the material presented below is intended only as a starting point for local communities to think about new ways to reduce transportation infrastructure costs and improve network performance.

Survey Best Practice Highlight:

Florida Regional Planning Procurement Practice.

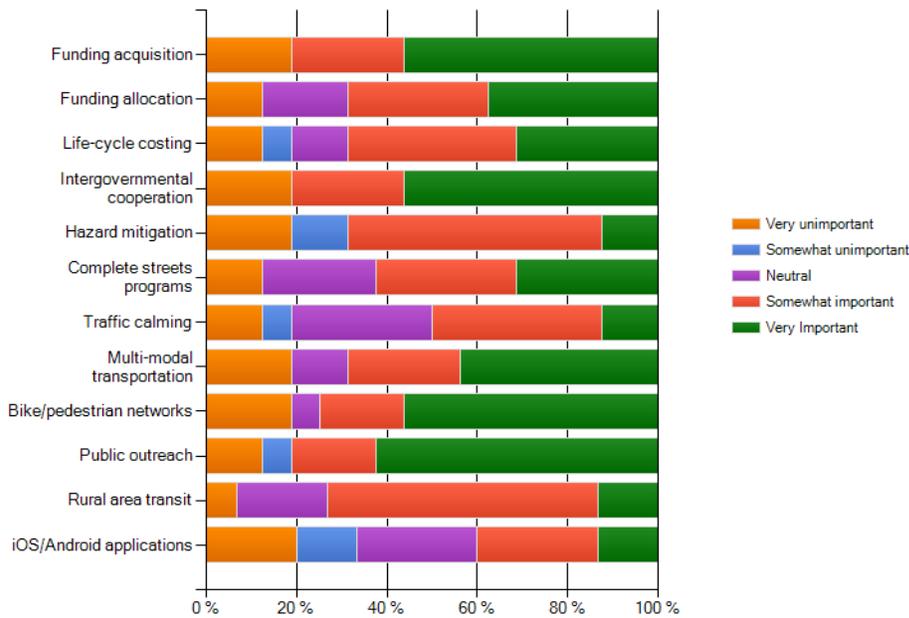
One MPO located in northern Florida, uses collaboration and consolidation to reduce equipment procurement costs for local jurisdictions. This is done by the MPO functioning as a regional procurement agent for participating counties. This is done in conjunction with the Florida Dept. of Transportation (FDOT), which handles the joint purchase for the regional group using local MPO funds, and then distributing the equipment to the counties served by the MPO. The counties in the MPO’s region are then responsible for any installation (if necessary), as well as the operation and maintenance of the procured equipment.

The take-away from this example is that the counties, which have less buying power when they act individually, benefit from the joint buying through the MPO, and the planning done by the MPO can help reduce duplicative spending on equipment.

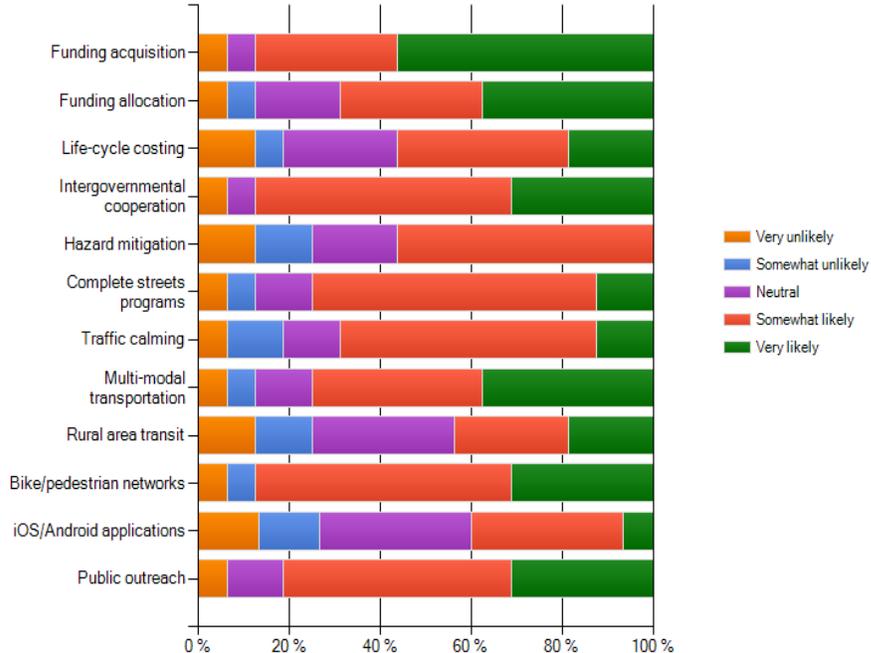
These practices, as well as the involvement and support of the state DOT in the shared procurement effort, provides a valuable example of both state and local governments working together to reduce transportation-related costs.

MPO Perceptions of Best Practice Areas' Importance and Likelihood of Implementation

How important do you feel it is for local governments to pursue innovation in each of the following areas?



How likely is it that local governments will pursue innovation and implement best practices in each area?



Transportation Infrastructure Cost Reduction Strategies

Across the country, it is clear that as our transportation infrastructure ages, the cost of expanding and maintaining it increases as well. In order to maintain transportation networks, local governments and planning organizations must address the question of how to most effectively and efficiently “spend smart”, considering new ways to address these costs when designing, redesigning, or repairing our existing infrastructure.

To that end, many local communities and jurisdictions are looking into and implementing new practices to help mitigate these rising costs and increase system efficiency.

In the process of investigating different transportation best practices, five strategies likely to reduce transportation infrastructure costs or improve system efficiency and effectiveness became apparent. Costs could be reduced and the system become more efficient and effective with the encouragement of :

- Improved system design, either during maintenance or when a transportation project is initially planned.
- The use of more cost effective materials and the implementation of better construction practices.
- Improved transportation system management processes.
- Changes in the behaviors of those who use the transportation system.
- Improved planning that takes into account strategies to reduce long-term transportation infrastructure costs.

This last strategy is not inconsequential to the problem and will be addressed further, below, as efficient maintenance and use of local transportation infrastructure requires consideration and planning at all stages of transportation need determination, funding acquisition, the implementation of improvements, researching new and viable alternatives, and encouraging fitting use of transportation networks. Each of these components is important to overall transportation planning success.

The approaches described in this *TrendLines* are not intended to provide an exhaustive list of what could be done to create a more cost effective and efficient transportation system, but are simply offered as illustrative examples of how the strategies offered above can be implemented in relatively simple ways at the local level.

Improving Transportation System Design

Spending priorities actually present themselves in the choices local governments make when addressing transportation network construction and maintenance. They can choose to defer spending on maintenance, for example, but that only increases future costs. Equally, they can use inefficient designs or materials when constructing or maintaining infrastructure, but, again, the price is paid for such inefficiency in future years.

What does not change, however, is that in order to maintain transportation service levels integral to the health of local economies, infrastructure must be maintained as well as built. For this reason, spending is a reality that cannot be avoided. Since the expenditure of public monies is required for this purpose, it is advisable to consider all options and opportunities to increase the cost effectiveness of how roadways and other transportation infrastructure can be designed and then built.

By taking the time to re-imagine the design process, jurisdictions have the opportunity to invest in infrastructure improvements that require less maintenance over a longer lifetime than other, *status quo* options might. This is because design features themselves can lead to increased longevity of transportation infrastructure assets as well as an improvement of network service. Some of these

design elements can be implemented when repair work is scheduled, while others require a complete overhaul of the existing roadway if they are not taken into account when the roadway is initially planned and designed.

For example, with the exception of turning from some one-way streets to other one-way streets, the **left-hand turn**, especially for large vehicles like tractor-trailers and delivery trucks, is wasteful of fuel and habitually dangerous to pedestrians and cyclists (New York Times, *Left-Hand-Turn Elimination*, Dec. 9, 2007: <http://www.nytimes.com/2007/12/09/magazine/09left-handturn.html>). Companies like UPS and Federal Express have reworked their delivery routes to eliminate all left turns to the greatest extent possible. This not only saves fuel, but also decreases the likelihood of an accident at an intersection. Heavy-duty government fleets are similarly situated to experience fuel savings in this manner.

The reduction of left hand turns can be accomplished when road projects are planned in a number of ways, the first of which is to take this into account when industrial parks or other uses that generate heavy truck demand are planned. It can also be considered when routes for heavy-duty trucks are planned or identified.

The state of Michigan, for example, has taken this to what some might consider an extreme, prohibiting left-hand turns on major arterials, creating what is being called the "Michigan Left". Traffic is funneled right, then into a U-turn lane for motorists wishing to turn left (Smithsonian.com, *Life Without Left Turns*, Jan. 11, 2011: <http://blogs.smithsonianmag.com/science/2011/01/life-without-left-turns/>). What are sometimes called *Superstreets* work similarly, in that they require the driver to navigate to a designated U-turn lane prior to crossing the arterial or navigating left (Gismag, *'Superstreet' Concept Shows Promise in Real-World Test*, Jan. 12, 2011: <http://www.gizmag.com/superstreet-concept-shows-promise-in-real-world-test/17553/>).

A useful redesign technique that can be implemented at relatively low cost is often known as a **road diet**. A road diet is a reconfiguration of an existing road that, according to the Federal Highway Administration, could involve:

...converting an undivided four lane roadway into three lanes made up of two through lanes and a center two-way left turn lane. The reduction of lanes allows the road way to be reallocated for other uses such as bike lanes, pedestrian crossing islands, and/or parking. (Federal Highway Administration, *Proven Safety Countermeasures: Road diet*, NDG: http://safety.fhwa.dot.gov/provencountermeasures/fhwa_sa_12_013.htm.)

But along with allowing other uses and improving pedestrian and cyclist safety, road diets can decrease wear, typically without affecting the ability of the roadway to handle existing traffic volume. The cost of implementing road diets are considered relatively low as the existing roadway footprint is maintained and only new striping may be needed. All-in-all, road diets can encourage multi-modal transportation options by making bike lanes possible, reduce congestion by calming traffic in an area, and even reduce roadway wear.

An excellent example is provided by the Cultural Trail in Indianapolis, IN. The metro government there imposed a road diet in the downtown cultural district to create a trail that includes three lanes for cars, one large mixed-use lane for pedestrians and cyclists, as well

11th Street, between Ash and Stevenson, Springfield
Bike Lanes on Two-way Street with Road Diet



After



Road Diet illustration

Before

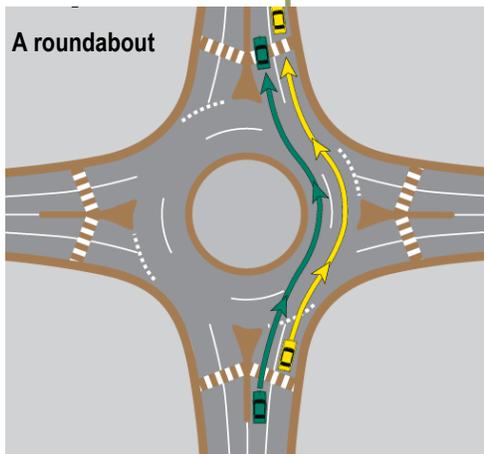


Section of Indianapolis Cultural Trail involving road diet.
Goindy.com

as large and inviting sidewalks that circuit much of the district (Indianapolis Cultural Trail, *About [the Cultural Trail]*, 2010: <http://indyculturaltrail.org/index.html>).

Roundabouts may also be considered as a means of improving system efficiency and effectiveness as a part of roadway design. The Federal Highway Administration describes the physical characteristics of roundabouts in this way:

...circular intersections with specific design and traffic control features. These features yield control of all entering traffic, channelized approaches, and appropriate geometric curvature to ensure that travel speeds on the circulatory roadway are typically less than 50 km/h (30 mph). Thus, roundabouts are a subset of a wide range of circular intersection forms. (Federal Highway Administration, NDG: <http://www.fhwa.dot.gov/publications/research/safety/00067/00067.pdf>).



In general, roundabouts are purported to offer such benefits as increased safety, reduction in frequency and severity of crashes, reduced traffic delays, traffic calming, reduced long-term operational costs, lower fuel costs, environmental friendliness, and improved aesthetic quality (Nevada Dept. of Transportation, NDG: <http://www.nevadadot.com/safety/roundabout/benefits.aspx>).

Roundabouts are not to be confused with traffic circles, which lost favor in the mid-20th century as congestion increased in cities across the country. Roundabouts are designed to have entering vehicles yield to the vehicles already within the roundabout as well as encourage lower speeds among motorists. Traffic circles, on the other hand, typically involve higher rates of speed, resulting in more accidents, while roundabouts tend to decrease such incidents (Roundabout USA, *Roundabouts vs. Circles*, 2013: <http://www.roundaboutusa.com/intro/roundabouts-vs-circles.html>).

Since the late 1990s, Carmel, IN, has been installing roundabouts as development occurs as well as retrofitting existing intersections. That city uses roundabouts as a design standard to not only address environmental issues, aesthetics, and safety, but also to decrease operating and fuel costs. With more than 60 roundabouts at the time of this publication, Carmel has become known for its roundabout network (City of Carmel, IN, *Roundabouts*, 2013: <http://www.carmel.in.gov/index.aspx?page=123>).

Curb extensions, or “bulb-outs”, are another design feature that communities can employ to increase transportation system effectiveness and efficiency for pedestrians and cyclists, as they increase walkability and encourage cycling. Curb extensions take advantage of existing on-street parallel parking by “extend[ing] the sidewalk or curb line out into the parking lane, which reduces the effective width of the street” where non-motorized users are looking to cross (Walkinginfo.org, *Crossing Enhancements*, NDG: <http://www.walkinginfo.org/engineering/crossings-enhancements.cfm>).

Crossing islands installed at crosswalks have a similar effect.

Both curb extensions and crossing islands also cause motorists to reduce their rate of speed, further limiting wear on roadways. An example of a curb extension can be found in Springfield at the Adams and 6th Street intersection.



The **Complete Streets** concept may also be considered as a best practice intended to improve transportation system efficiency and effectiveness. Unlike roundabouts and curb extensions, however, it is not an engineered feature of a roadway as much as it is a way to think about how roadways should be designed. Complete Streets can involve a myriad of individual design features, but the over-arching theme is that an appropriate amount of transportation “space” be allotted to pedestrians, cyclists and motorists when roads are designed.

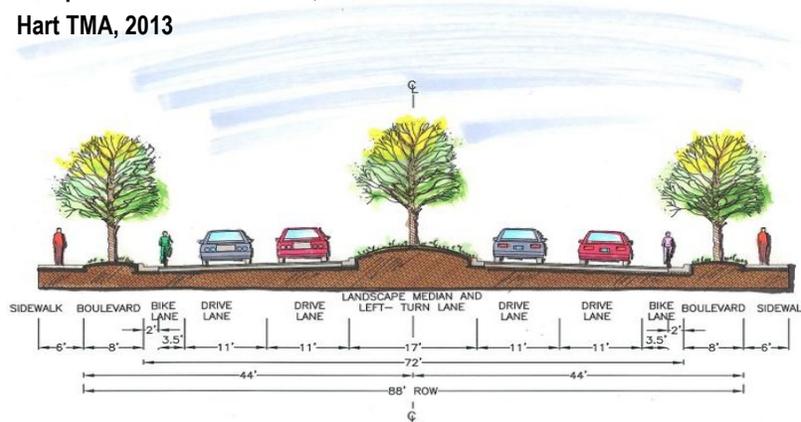
According to Smart Growth America, Complete Streets are:

... designed and operated to enable safe access for all users. People of all ages and abilities are able to safely move along and across streets in a community, regardless of how they are traveling. Complete Streets make it easy to cross the street, walk to shops, and bicycle to work. They allow buses to run on time and make it safe for people to walk to and from train stations. (Smart Growth America, *Fundamentals*, 2010: <http://www.smartgrowthamerica.org/complete-streets/complete-streets-fundamentals>.)

As one might surmise from the above, Complete Streets programs encourage non-motorized traffic, are pedestrian-friendly, and can have a traffic calming effect. They not only impact safety, aesthetics and efficiency for multi-modal users, but can also serve an economic development purpose.

Complete Streets Illustration, Hart TMA, 2013

As jurisdictions implement Complete Streets programs, many experience development and growth in the surrounding local economy. This is because Complete Streets stimulates local economies not only through the transportation cost-savings they generate for residents and visitors who choose to bike or walk to their destinations, but also through their ability to encourage local development. As development occurs, more jobs and higher tax revenues are generated along these redesigned roadways (Smart Growth America, *National Complete Streets Coalition*, 2010: <http://smartgrowthamerica.org/complete-streets/complete-streets-fundamentals/factsheets/economic-revitalization>).



The application of Complete Streets may necessitate a complete overhaul of an existing roadway, but new infrastructure projects are ideal for implementing the concept as they avoid some right-of-way issues and can address the additional construction costs that a full application of the concept may require.

More Efficient Materials and Construction

Roadway pavement is typically designed to bear traffic demand for 20 years with regularly scheduled maintenance. But just like a house or any other structure can show cracks as it “settles”, so can a street or road, reducing its life-span. One of the reasons why a roadway may fail is poor **compaction**; including compaction of the soil below the roadway, the asphalt used in the roadway, or both.

Compacting the soil below a roadway — by static force techniques such as impact, kneading and pressure, or by vibration, using construction equipment and techniques designed for this purpose — is done to maximize the density of the soil under it. Compacting the soil — or the asphalt of the roadway — increases its load-bearing capacity by minimizing shifting and differential settlement. Compacting provides additional stability for the roadway as a structure, and also reduces water seepage and its related swelling and contracting due to freeze-thaw conditions. This can help reduce the cracking and crumbling of roadway materials due to winter weather.

Compaction standards are an aspect of roadway design and construction that can be established to generate long-term savings for a jurisdiction. By establishing and enforcing compaction standards, the use of materials and processes which lead to the eventual costly roadway degradation — including moisture damage, rutting, raveling, accelerated aging, increased fatigue, and decreased strength — particularly on roadways near gutters, curbs and storm sewers, can be avoided (Texas Dept. of Transportation, *Compaction Importance*, 2013: <http://onlinemanuals.txdot.gov/txdotmanuals/pdm/compaction.htm#i1010189>).



Minn. State Dept. of Transportation

JUN 24 2005

Absent appropriate standards, design and construction practices may vary from developer to developer and development to development, creating a wide range of roadway quality within the same community. Including compaction standards in a local development code reduces the likelihood of needing to repair or rebuild roads outside of the usual maintenance or life-cycle.

The use of particular types of materials is another avenue where jurisdictions can “spend-smart”. Researching new methods and challenging engrained construction procedures can provide opportunities for communities to adopt more cost-effective practices, and technologies in these areas continue to improve and become more affordable.

There are a variety of construction materials and pre-fabricated infrastructure items that can prove to be more cost effective over the lifetime of a project. One of these is **pervious concrete**.

Roadway infrastructure and its paving are some of the most costly expenditures that a community faces. As such, many jurisdictions around the country are experimenting with pervious, or porous, concrete as an alternative to traditional hot-mix asphalt (HMA) or Portland cement concrete (PCC) in order to address the impervious cover issues related to storm water management.



Pervious concrete application

Ontario Ministry of Transportation

Pervious concrete consists of standard cement, however it has a void range of 15-25%, allowing water to pass through (Kevern, J.T., Schafer, V.R., and Wang, K., *Mixture Proportion Development and Performance Evaluation of Pervious Concrete for Overlay Applications*, *Materials Journal*, July 1, 2011). This allows for storm water to drain more naturally than traditional concrete and associated drainage systems. As the expense and scale of necessary storm water management networks grow, jurisdictions and developers alike are looking for ways to mitigate those costs while still complying with local regulations.

When contemplating the use of pervious concrete, municipalities are encouraged to keep a few things in mind. First, taking the time to develop local expertise on the subject is critical, as there is no such thing as a “national” standard when it comes to this product. Second, for pervious concrete to be effective, it must be maintained. This can include sweeping, vacuuming, and/or power washing. Soil analysis and site suitability is also an important factor to consider.

Third, and related to the first caution, nearby soil types need to be analyzed and verified as able to handle the extra water discharge as some soil types are simply not suited to absorb large amounts of water. For example, many clay and clay-type soils will inhibit storm water management as clay compresses into a density much like regular concrete.

Fourth, snow plowing is also something to keep in mind. While the act of snow plowing does not reduce the effectiveness of pervious concrete roadways, it does have an aesthetic effect, generating a “salt-and-pepper” appearance which may be unwanted by communities.

Finally, in addition to the engineers and materials scientists involved in roadway design, landscape architects should also be consulted when designing projects that include the use of pervious concrete. These professionals are typically more suited than others in addressing vegetation issues around pervious concrete roads, not only for maintenance purposes (e.g., falling leaves which could clog the concrete as they break down, expanding root systems that could cause the pavement to buckle, etc.), but also for aesthetic reasons. Pervious concrete roadways typically allow for a greater level of nearby landscaping due to the increase in water available to nearby root systems.

One of the items that may add to the cost of a roadway is street lights. Of course this involves a direct cost, that of the lights, but there is also the indirect cost of the electricity to power them.

Communities will often select mercury vapor or sodium based lights for this purpose, but a more cost effective option is **LED street lights**. LED lamps offer lower power consumption, longer lifetimes, decreased insect activity, and yield higher light outputs than the more traditional street lighting options. Cities that have transitioned to LED street lighting, such as Boston, MA, report a return on their investment of only one year based on the reduction in energy costs for these lights and their longer lifetime; up to three times longer than such traditional lighting as mercury vapor and sodium (City of Boston, *LED Street Lighting*, 2013: <http://www.cityofboston.gov/publicworks/lighting/led.asp>).

One local example of successful LED street light retrofitting is in the Village of Chatham. In cooperation with the Illinois Dept. of Commerce and Economic Opportunity (DCEO) and the Illinois Association of Regional Councils (ILARC), the SSCRPC administered a series of Energy Efficiency Conservation Block Grants funds in the region during 2010 through 2012. Chatham received \$19,120 in these funds to replace 100 existing 150 watt NEMA HPS street lights with Lektron LED retrofit kits. Using these kits, energy efficient street lights were successfully installed in over a quarter of the Village’s street lights, which is estimated to save 55,036 kWh of energy per year. Chatham estimated a savings from the new street lights of over \$3,800 per year in energy use alone.



LED streetlights
Town of Cicero News Wire

Improving Management Practices

How communities manage their transportation systems can also create cost efficiencies as well as improvements in system performance. For example, one of the most efficient and effective ways to reduce long term roadway costs is through **improved routine maintenance**. Creating and following a routine maintenance schedule is an effective means of prolonging the life of a roadway. Spending smart to address maintenance issues typically proves to be less costly than addressing disrepair through larger-scale construction projects.

As long ago as 1985, the American Association of State Highway and Transportation Officials (AASHTO) defined pavement management as “the effective and efficient directing of the various activities involved in providing and sustaining pavements in a condition acceptable to the traveling public at the least life cycle cost” (Pavement Interactive, *Pavement Management Systems*, August 16, 2007: <http://www.pavementinteractive.org/article/pavement-management-systems>).

Effective pavement management systems prolong the life and quality of a roadway, and typically include surveys on the condition of the pavement, a maintained database that includes all necessary pavement information, an analytic scheme to determine the real life-cycle costs, decision criteria, and implementation procedures to apply management system decisions once they are made.

All-in-all, pavement management systems aid in preventative maintenance, extending the life of the road and lowering costs to the local jurisdictions that develop and employ them.

How communities plan and schedule maintenance as a way to **leverage other improvements** can also be important. For example, communities can take advantage of such routine maintenance activities as repaving and/or restriping roadways as a more cost efficient way to implement other needed road improvements. In situations where labor and equipment have already been allotted for an initial purpose, the cost of making such ancillary changes as implementing road diets or adding bicycle lanes can be reduced if they are done at the same time.

Costs may also be reduced through **equipment sharing**. Due to the high upfront cost of capital equipment items needed for township and municipal infrastructure maintenance and repair, the CEC researched opportunities for local equipment sharing between and among smaller municipalities and township road districts. Many smaller municipalities in the region do not have the capacity to purchase or maintain the myriad vehicles and pieces of equipment, particularly specialized items, necessary for road and street maintenance, so the ability to share equipment, or even rent the equipment from one another on an as needed basis, presents a means of reducing costs.

Jurisdictions within Sangamon County are to a degree already working to employ efficient equipment sharing practices as noted in the CEC's Feb. 13, 2013, recommendation encouraging the sharing of infrastructure equipment among all of the jurisdictions in the County (<http://www.co.sangamon.il.us/Departments/RegionalPlanning/documents/CEC/Infrastructure%20Equipment%20Inventory%20Recommendation.pdf>). In its recommendation, the CEC notes that major equipment sharing or renting presents an opportunity to reduce infrastructure costs for jurisdictions of all sizes, and is a particularly viable option for smaller jurisdictions with lower operating budgets.

For example, the CEC found it may not be cost effective for communities the size of the Village of Sherman to own and maintain an asphalt "patcher". Such equipment simply may not be needed of-

ten enough to make the purchase cost efficient, and it would cost upwards of \$50,000 to rent one in order to address pothole maintenance in the jurisdiction. However, the nearby City of Springfield owns and operates patchers. Using an intergovernmental agreement between the Village and the City, Sherman could rent a patcher from Springfield or contract with Springfield for patching services at a much lower cost than the other options available to it.



This can also extend to the **sharing of labor and services**. For example, in an August 2012 meeting of the CEC's Public Works Committee, a description was given of the arrangement made between Clear Lake Township and the Village of Sherman to share the services of Sherman's diesel mechanic in exchange for the completion of some small construction projects, such as the construction of a culvert, by the Township.

This sort of service and equipment sharing happens on an informal basis in many areas throughout the country, and can be expanded in both formality and geographic scope. The CEC noted that some liability concerns related to equipment sharing would need to be addressed for wider-ranging sharing to be possible, but increased communication about its potential could help expand the practice.

The CEC also found that **procurement and supply management** can provide sources for infrastructure cost reduction, and the CEC recommended that local jurisdictions participate in joint procurement and purchasing coalitions in order to enjoy the benefit of economies of scale (CEC, *Joint Procurement Efforts in Sangamon County Municipalities and Special Districts*, June 10, 2013: <http://www.co.sangamon.il.us/Departments/RegionalPlanning/documents/CEC/Procurement1%20Recommendation-%20Updated.pdf>). This not only allows for potential cost reductions, but also fosters a culture of inter-jurisdictional cooperation and coordination, and can also improve capital planning efforts among smaller jurisdictions.

The CEC noted that, working in tandem with equipment sharing activities, the implementation of joint procurement procedures could have the potential to increase efficiency and lower the cost of infrastructure projects and practices. For instance, and specific to transportation, opportunities for increased joint procurement may exist between the Sangamon County Highway Dept. and smaller municipal governments. But in order for the maximum savings from such efforts to exist, capital planning and open avenues for communications must exist as well.

The CEC also investigated the potential for cost reductions arising from supply management related to public works equipment and government fleets. Parts inventory and supply management are components closely linked to the procurement conversation, as transportation-focused entities can target procurement to ensure that limited resources are not being expended on unnecessary stock or obsolete inventory. The CEC also explored the privatization of parts inventory in various types of government fleets, which may have implications for procurement best practices considered for implementation by municipalities.

Another component of improved transportation management practice that should be considered is related to **improving the knowledge and skills of employees** involved in it. Ensuring that workers are provided with the opportunity to learn new technologies and acquire new skills is as important to achieving effective and efficient use of labor as providing them with the equipment necessary to do so. This allows communities to increase efficiency in their operations, lowering labor costs while allowing service improvement and expansion. Though not an example drawn from transportation, after completing a new facility in Springfield, the Springfield Metro Sanitary District continued to elevate its facility standards by prompting staff to become industry certified and recognized for their knowledge about, and operation of, the new technologies.

By creating a culture of learning and embracing new technologies, jurisdictions can increase both efficiency and effectiveness.

Another method of savings is the implementation of **franchise agreements for utility vehicles**, particularly heavy-duty vehicles used for such services as waste management. In any given area, multiple public and private options are available for waste management services. This can lead to high levels of inefficiency as multiple trucks are running limited routes to serve clients along the same routes. Franchise agreements in this particular case would involve the local government in contracting with a single service provider — city-wide or by geographic service area — thus limiting the wear and tear on roads from extremely heavy vehicles.

Of course, there are factors to take into consideration when contemplating or negotiating a franchise agreement of this nature. There are concerns that franchise agreements create monopolies and eliminate consumer choice. To that end, there are steps that can be taken to mitigate these risks. The first is making the contract for a set period of time, which when expired, opens the door for bidding between service providers. This can help reduce costs and allow the opportunity for new service providers to enter the mar-



marketplace. Consideration should also be given to allowing smaller, local companies to compete with larger firms. This could include local subsidies or utilizing public engagement to inform municipal decisions.

Along a similar vein as limiting heavy-duty vehicle routes along roadways, consideration can be given to using **public transit as a school travel option**. As many public transit routes typically run along similar routes as school bus fleets, municipal jurisdictions may wish to work with school districts to consider use of those services in lieu of school bus services to reduce roadway wear, decrease operational costs for school districts, and increase the culture of public transit ridership among younger age cohorts.

One should be aware that in some states and regions, school districts are legally prohibited from utilizing or promoting public transit as a means of transporting children from their homes to school. In this case, magnet, private and charter schools may provide an opportunity for the implementation of a district-wide public transit program.

Practices Involving Public Behaviors

Not all best practices revolve around new approaches to design, different materials, or improved management practices. Some of the most effective ways to address transportation infrastructure needs can arise from practices that change the behaviors of those who use the system.

Some examples, such as road diets (which slow traffic, thus reducing wear and tear) and reducing left turns (particularly for heavy vehicles), were provided previously. Even adoption of the Complete Streets concept fits into this category, as it is intended to encourage non-motorized vehicular movement by encouraging residents to walk or bike.

Other possibilities arise from planned efforts to encourage less vehicle traffic on local roads.

For example, one alternative for lowering costs related to preserving and maintain road networks is by **reducing vehicular traffic** on them. It is intuitive that if vehicular traffic is reduced, there is less wear and tear on roadways, allowing them to be maintained at lower costs over longer periods of time. Reducing vehicular traffic — or the nature of it — also reduces the need for roadway widening and new roadway construction, allowing monies that would otherwise be spent for these purposes to instead be used for improved maintenance on existing roads. But how is a community to do this?



Reducing vehicle traffic implies alternative transportation mechanisms, such as walking, biking or transit. These modes of travel increase the long-term impact of each dollar spent on transportation infrastructure preservation and modernization by reducing daily traffic counts. Additionally, these travel options provide other benefits in terms of reduced healthcare cost and reduced household spending on automotive-related bills.

For instance, in the Springfield Area Transportation Study's (SATS) *Bicycle and Pedestrian Plan* (August 2012), local leaders noted that the Rails to Trails Conservancy found that, "Since car ownership is the second largest expenditure for the average American household, driving less can free up substantial resources for other needs". Freeing resources can mean additional disposable income that could be spent locally, promoting local business growth and generating tax dollars. At a time when municipal governments are experiencing a shortfall in revenues, these results become particularly desirable.

Communities throughout the country and in our region are creating, adopting and implementing bicycle and pedestrian plans. Local jurisdictions even have the opportunity to network their plans in order to achieve greater effectiveness. Locally, bicycle paths such as the Lost Bridge Trail and Interurban Trail have been in use for some time, but these paths primarily link Rochester and Chatham, respectively, to the periphery of Springfield. With the adoption of the regional bicycle and pedestrian plan in 2012, these existing trails are intended to be networked and connected to a proposed on and off-road trail and pathway system within Springfield itself, offering greater access and creating more complete connectivity.

Another way to reduce vehicle travel is to re-imagine parking strategies in typically congested areas or along routes where municipalities are looking to lower the speed limit. The practice of striping **back-in, angled parking spaces** has met with success in many places, including San Francisco, CA, and Austin, TX.

This style of parking not only allows the driver to see more clearly as they exit the space, but also allows for less parking spaces, which serves to encourage users to pursue other modes of transportation. An additional advantage of this form of parking is that it calms traffic. As drivers enter the spaces, drivers behind must slow to accommodate a driver parking. Reducing speeds along roadways tends to lower the rate of wear that roads experience.

It may also be possible to change travel behaviors by **embracing technology**. For example, aside from increasing service and expanding routes, localities have found that making free WIFI available on public transit buses and light rail increases ridership. Studies have shown that the age group often known as the 'Generation Y' or 'Millennials', are less likely to drive or own a vehicle than other generations, and as such are prime clients for public transportation agencies (New York Times, *Young Americans Lead Trend to Less Driving*, May 13, 2013: http://www.nytimes.com/2013/05/14/us/report-finds-americans-are-driving-less-led-by-youth.html?pagewanted=all&_r=0). Increasing amenities available to riders, such as in-route WIFI increases the popularity and usage of public transit services.



Additionally, with the advent and proliferation of various smart devices — from phones to personal data devices — many communities are experimenting with, and garnering success, from the usage of public-driven applications, or 'apps', that assist them with travel and shape their behaviors. These apps range in service from those that inform a transit user when the next train and bus is arriving, to those that help them make commuting decisions by informing them prior to a commute as to the best routes to take given road conditions, planned maintenance work, accidents, and traffic back ups.

It can also be used as a management tool. For example, in Indianapolis, IN, the metro government has had success with an app known as "RequestIndy Mobile", which allows residents to request non-emergency city services, including pot-hole repair. A similar app was implemented by the Springfield-Sangamon County Regional Planning Commission that allows bicyclists to report hazardous storm grates and other road problems that present hazards to biking safety.

In general, finding ways to adjust and leverage the public's transportation behaviors can prove to be worthwhile for both the local government and its residents.



Improved Planning

Of course, any conversation about improving the transportation system inevitably leads to the importance of planning. All of the practices indicated above require additional planning, and thoughtful planning is central to the creation and management of an effective and efficient transportation system.

Using an effective planning process, communities can increase their own capacity, efficiency and effectiveness, particularly if they think regionally and **take into account the plans of other adjacent and nearby communities**. Doing so eliminates the possibility of fractured connectivity between jurisdictions and potentially increases the transportation options that residents have available to them. For example, and as suggested previously, walking, bicycling and public transit all become more viable options when the connectivity between where people live and the destinations where they want to go is improved.

But in addition to this, there are specific actions that individual communities can take as part of their planning process that will serve to reduce costs and improve transportation system performance.

The first, of course, is to comprehensively **plan all capital improvements**, including establishing time lines and performance standards for both construction and maintenance, keeping the plan up-to-date, budgeting for the improvements and maintenance, and then following through on the plan. As noted, effective municipal capital planning includes addressing the future maintenance of all improvements included in the municipal capital plan. As Charles Chieppo, writing for *Governing.com*, points out:

Over the life of a typical transportation asset, operations and maintenance are several times more expensive than initial construction costs. But public-capital budgets are almost always based solely on building costs. Once maintenance is underfunded on the capital side, the burden shifts to the operating budgets of the agencies that usually have neither the money nor an incentive to fund it.

...The best way to solve the problem is for governments to calculate the lifecycle cost of an asset and appropriate the funds based on that amount, not just construction costs. In addition to saving money, regular, sustained maintenance increases performance, extends life and maximizes the safety of public infrastructure. (Chieppo, *When New Asphalt Gets Old*, *Governing.com*, Sept. 13, 2011)

Taking operating and maintenance costs into account by way of a capital plan can be problematic politically, because, as Chieppo notes, while cutting ribbons on a new transportation infrastructure project pays dividends for the public official during whose term it is completed, the savings from properly funded maintenance may be long in coming, most often accruing to the ribbon-cutting official's successors.

One way to address this fact of life is by making **life-cycle cost analysis**, as mentioned by Chieppo, a fundamental part of local capital project planning and budgeting.

Most often when infrastructure projects are planned and implemented, the focus is on construction costs alone. But the cost of a new road or bridge does not end when the project is built as that infrastructure must be maintained over its life-time, potentially requiring that it be re-engineered or re-developed, and in some cases, even eliminated. Life-cycle cost analysis provides a method for measuring the long-term costs of a capital project like a road or highway, and includes the assessment of such cost factors as acquisition costs (land, materials, etc.), design and engineering, installation and construction, operational costs (if any), maintenance over its expected life-time, anticipat-



ed future upgrading, and potentially disposal, among other things. Using this process, certain design features or materials can be added or eliminated if they do not address local needs.

This approach can lead to future savings in repair or reconstruction, and it also allows the municipality to better judge the costs of maintaining new infrastructure — or infrastructure improvements — into the future, and therefore better save and budget for them.

Life-cycle cost analysis can also illustrate savings *indirectly* related to a project's design and construction. It allows for reduced healthcare costs and time savings to be taken into account, for example. A recent case showing the advantages of life-cycle cost analysis was illustrated by the High Speed Rail feasibility study conducted for Springfield, which indicated that there were significant savings to motorists in both fuel and time depending upon which railroad corridor was used.

The Importance of Applying Better Practices

Aging infrastructure is a major concern for municipalities across the country, and local governments in Sangamon County are no exception. For example, in this region this problem is of particular importance to the City of Springfield as it maintains the largest number of municipal roadway miles in the county. The Greater Springfield Chamber of Commerce report discussed on page 2 of this *TrendLines*, paints an informative picture of that city's infrastructure funding needs and the challenges it faces in generating the revenues needed to address them. The Chamber report accurately identified the importance of strong infrastructure to a sound and growing local economy, and underscored the growing need to better maintain and improve infrastructure, calling it a "lifeline to the economy."

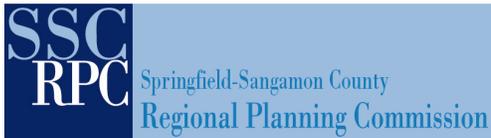
However, the Citizens' Efficiency Commission found that the committee's report did not address innovative or alternative methods — better practices — that would result in reducing the estimated needs of future infrastructure costs. The suggestion is that municipalities must look to new and improved practices that will reduce transportation infrastructure costs both now and in the future. A few simple ones are offered in this *TrendLines* as conversation starters and food-for-thought.

There are many other best practices available, but a full review of all possible alternatives and innovative approaches goes beyond the purposes of the brief review provided here. In addition, many of those are subject to limiting factors such as population density and geographic location. What we have tried to do here is present those that are more universal in nature and have the potential to be implemented in almost any jurisdiction regardless of its size or system capacity.

The improvement of our transportation infrastructure and its planning are two of the most prominent issues that will be facing municipalities in coming years. Infrastructure built in the mid-20th century is showing its age and is in need of repair across the United States. In times of recession and economic constraint, many jurisdictions lack the resources to properly address the growing need for repair and replacement of roadways, bridges, sidewalks and other capital items, let alone find the means to begin new projects.

This makes the demand for more creative thinking about and planning for our infrastructure needs even more critical. Considering new design techniques, researching new materials, implementing better management practices, changing costly public behaviors, and better planning, must be considered if we are to address our future transportation needs and move away from the "business as usual" approaches we have used in the past.





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Regularly Scheduled Events:

- **The Springfield-Sangamon County Regional Planning Commission meets in the Sangamon County Board Chamber at 9:30 AM on the third Wednesday of each month unless otherwise posted.**
- **The Springfield Area Transportation Study Technical Committee meets in Room 212 of the County Building at 8:30 AM on the first Thursday of each month, with the Policy Committee meeting at noon on the following Thursday, unless otherwise posted.**
- **The Sangamon County Historic Preservation Commission will meet in Room 212 of the County Building at 4:00PM on the first Wednesday of every month unless otherwise posted.**

A complete schedule of SSCRPC events is maintained on the Commission's website.

OTHER SSCRPC DOCUMENTS AND ANALYTIC WORK ON CURRENT TOPICS OF INTEREST, ARE AVAILABLE ON THE COMMISSION'S WEBSITE.

About the Springfield-Sangamon County Regional Planning Commission



The Springfield-Sangamon County Regional Planning Commission (SSCRPC) is the joint planning body for the City of Springfield and Sangamon County, and serves as the Metropolitan Planning Organization for transportation planning in the region. Along with these on-going responsibilities, the Commission works with many other municipalities, public agencies, public-private entities and not-for-profits throughout the region to promote orderly growth and development.

The Commission that oversees this work is made up of 17 members,

including representatives from the Sangamon County Board, Springfield City Council, special units of government, and six appointed citizens from the city and county.

Through the work of its professional staff, the Commission provides overall planning services related to land use, housing, recreation, transportation, economic development and redevelopment, and many environmental matters, as well as special projects of local and regional interest. In carrying out these tasks, the SSCRPC conducts numerous research studies, analyt-

ic reviews and planning projects each year, all of which are made available on its website.

The SSCRPC also prepares area-wide planning documents and assists the county, cities, and villages, as well as special districts, with planning activities.