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From the RealEstateJournal Archives

Homeowners Love Cul-de-Sacs, Planners Say They're Perils

by Amir Efrati

From The Wall Street Journal Online

June 05, 2006

One of the most popular features of suburbia is under attack.

For many families, cul-de-sac living represents the epitome of suburban bliss: a traffic-free play zone for children, a ready roster of neighbors with extra gas for the lawnmower and a communal gathering space for sharing gin and tonics. But thanks to a growing chorus of critics, ranging from city planners and traffic engineers to snowplow drivers, hundreds of local governments from San Luis Obispo, Calif., to Charlotte, N.C., have passed zoning ordinances to limit cul-de-sacs or even ban them in the future.

In Oregon, about 90% of the state's 241 cities have changed their laws to limit cul-de-sacs, while 40 small municipalities outside Philadelphia have adopted restrictions or bans. Even when they're not trying to stamp them out, some towns are keeping a close eye on how cul-de-sacs are being built. Earlier this year, the city of Pekin, Ill., established new rules to make cul-de-sacs more maneuverable for service vehicles like fire trucks and school buses.

While homes on cul-de-sacs are still being built in large numbers and continue to fetch premiums from buyers who prefer them, the opposition has only been growing. The most common complaint: traffic. Because most of the roads in a neighborhood of cul-de-sacs are dead ends, some traffic experts say the only way to navigate around the neighborhood is to take peripheral roads that are already cluttered with traffic. And because most cul-de-sacs aren't connected by sidewalks, the only way for people who live there to run errands is to get in their cars and join the traffic.

In Charlotte, where the suburbs have emerged as a leading cul-de-sac battleground, a recent study by transportation planners found that almost all of the city's heavily congested intersections were located near residential developments from the 1960s, '70s and '80s, which are filled with cul-de-sac neighborhoods. The biggest traffic problems aren't in the old central cities these days, says Orlando, Fla.-based traffic engineer Walter Kulash, "but rather in the suburban periphery."

Land-use planners trace the origin of the American version of the cul-de-sac, which means "bottom of the bag" in French, to a development in Radburn, N.J., in 1929. Land planner Ed Tombari of the National Association of Home Builders says the design became popular during the housing boom after World War II, when many families turned away from the congested grids of central cities to live on quiet cul-de-sacs with lawns

and winding roads more reminiscent of the countryside. To ensure privacy, developers limited the number of roads leading in.

According to the Census Bureau, the population of American suburbs grew 12% from 1980 to 2000, while the total population in center cities grew by just 1%. Likewise, from 1997 to 2003, the total percentage of American housing units located in the suburbs rose to 62 million, an increase of about 9%. The influx of homes in the suburbs, and the traffic they bring, has become the chief concern of planners across the nation, many of whom are struggling to mitigate the impact of car culture.

To some of them, cul-de-sacs have come to represent a failed experiment that has produced more isolation and more traffic by forcing people into their cars. David Schrank, a transportation researcher with the Texas Transportation Institute at Texas A&M University, says the old "peak hour" of traffic in many suburbs has been replaced by a longer "peak period." As new developments spring up, he says, "sometimes the transport network isn't in place to support them."

In some growing suburbs, "cul-de-sac" is becoming a dirty word. At a meeting in April with the planning commission in Northfield, Minn., a suburb of Minneapolis that has adopted rules preventing the use of cul-de-sacs, developer Lynn Giovannelli of Miles Development says she was "blindsided" by a chorus of objections about a single cul-de-sac she was including in plans for part of a new subdivision called Rosewood. "The land parcel was a funky shape, and I told them the only way to do anything with it is to do a cul-de-sac," she says. One commissioner told her to put in a park instead. "Preposterous," she says. "I was rolling my eyes."

While the plan was ultimately approved, it wasn't unanimous. "We might be prejudiced," says Jim Herreid, one of two commissioners who voted against the plan. "But we just don't like cul-de-sacs because they restrict the ability to get around town easily."

For all the criticism aimed at them, cul-de-sacs do seem to have one last defender: the free market. Real-estate brokers say that despite the recent opposition by policy makers, homes on cul-de-sacs still tend to sell faster than other homes -- and often command a comfortable premium. Ralph Spargo, the vice president of product development for Standard Pacific Homes in Irvine, Calif., says his company charges as much as 5% more for a home located on one. (For a house that sells for the April 2006 national median price of \$223,000, that works out to about \$11,000).

Rochelle Johnson, a 38-year-old real-estate agent from Lakeville, Minn., who grew up on a cul-de-sac, says she doesn't worry about the "isolation" -- she welcomes it. From her home on a cul-de-sac in a development called Wyldwood Oaks, Mrs. Johnson says the minimal amount of traffic gives her the peace of mind to allow her two children to play soccer in the street. "I don't know why somebody wouldn't want to live on a cul-de-sac," she says.

While suburban planners aren't trying to retrofit existing cul-de-sacs, they are making a concerted effort to make sure that new developments don't repeat some of their perceived faults. In cities like Boulder, Colo., and San Antonio, where suburban-style development is still taking place within city limits, new regulations have narrowed street widths in some new developments to make them easier to cross by foot. In a host of cities in Oregon, including Portland, lawmakers have shortened the acceptable length of street blocks to about 500 feet, down from 800 to 1,000. And in Rock Hill, S.C., which changed its rules in March, ~~developers who build cul-de-sacs are required to cut pedestrian paths~~ through their bulb-like tips to connect them to other sidewalks and allow people to walk through neighborhoods unimpeded.

By reducing cul-de-sac construction, developers say, local governments are depriving them of one of the most popular -- and lucrative -- housing types at a time when the housing market is slowing down in many regions. In Ames, Iowa, developer Chuck Winkleblack of Hunziker & Associates says new regulations on cul-de-sacs there have reduced choices for buyers. In the 1980s, when his company built a neighborhood called Northridge, there were 23 cul-de-sacs in the 410-home community. By contrast, Northridge Heights, a project set to be completed in 2009, calls for 350 single-family homes and 150 townhouses and apartments with only two cul-de-sacs. "I had to beg and plead to get those in," says Mr. Winkleblack.

Trade-Offs

Although the campaign against cul-de-sacs continues, lawmakers are making some concessions. As a trade-off for limiting them, cities like Nashville, Tenn., are letting developers put more homes, including townhouses and apartments, on less land. And in some places, measures being planned to increase traffic flow have been beaten back. In late 2004, when residents of two upscale subdivisions in York County, S.C. -- Eppington and Knight's Bridge, with homes in the \$500,000 to \$600,000 range -- got wind of a plan to connect them, by roads, to a proposed development called The Reserve, which had lower-priced homes, residents of the wealthy areas pressured the county council to nix the proposal.

In the meantime, Beth Bowlds, a speech pathologist and mother of three living on a cul-de-sac in McKay's Mill -- a subdivision in the Nashville suburb of Franklin -- says she understands the traffic issues cul-de-sacs can create and why the local planners have taken steps to limit them. Yet when she and her husband were shopping for a home two years ago, she was immediately drawn to the cul-de-sac anyhow. "It's nice having your little corner that's not as public."

Email your comments to rjeditor@dowjones.com.

Cul-de-sac Research

Pros

- Close contact of nature because there are not cars going by every minute.
- Can fit more houses into oddly shaped tracts and build right up to rivers and property lines.
- Fire trucks have more room for turn around.
- Most home buyers prefer cul-de-sacs.
- Home buyers will pay 20% more for a home on a cul-de-sac.
- Cul-de-sacs are a tool, that when used sparingly, can help developers build balanced and attractive subdivisions.

Cons

- Have to drive car everywhere.
- Cul-de-sacs have some of the highest rates of traffic accidents involving young children.
- Cities such as Charlotte, SC, Portland, OR, and Austin, TX, have banned cul-de-sacs.
- There is no connectivity with cul-de-sacs.
- It is harder to walk/drive around neighborhoods
- Emergencies cannot be responded to as quickly.
- Harder for postal delivery, garbage pickup, pizza delivery etc.
- Snow storage: unlike streets, which only have a curb cut or access every 50 to 70 feet, typical cul-de-sacs have between 5 and 7 accesses intersecting them in very short intervals. The City is forced to plow the snow into a pile in the middle because otherwise the driveways literally get buried beneath mounds of snow (cul-de-sacs have a deceptively large surface area).
- Cul-de-sacs have a negative affect on the orderly growth of the City. It is much easier to plot out future transportation corridors if there are no artificial (man-made) impediments.
- Hundreds of local governments from San Luis Obispo, Calif., to Charlotte, N.C., have passed zoning ordinances to limit cul-de-sacs or even ban them in the future.
- Northfield, MN has adopted rules preventing the use of cul-de-sacs.

Cul-de-Sac Ban, The

Nothing divides suburban developers and "smart growth" advocates as much as the lowly cul-de-sac. The real estate community loves the meandering, dead-end streets; lots on them sell quickly and at a premium, thanks to their low traffic and perceived safety benefits. But critics complain that cul-de-sacs are a poor use of land; they funnel cars onto clogged arterial routes and restrict access to neighborhoods when emergency vehicles need to respond.

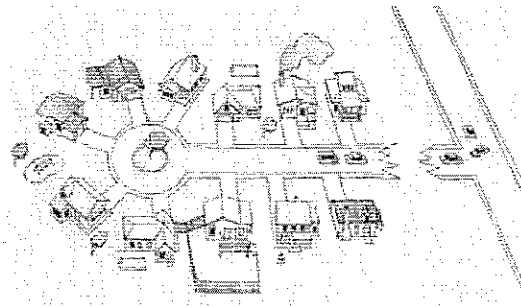


ILLUSTRATION BY LAUREN NASSEF

For decades the developers have been winning this battle. But this fall, Virginia, under the leadership of Gov. Tim Kaine, became the first state to severely limit cul-de-sacs from future developments. New rules require that all new subdivisions attain a certain level of "connectivity," with ample through streets connecting them to other neighborhoods and nearby commercial areas.

Forensic Polling Analysis

The American Association for Public Opinion Research censured a Georgia-based firm called Strategic Vision I. I. C. in September for failing to reveal information about how it conducted its polls during the 2008 presidential race. The company's chief executive promptly threatened to sue, which struck Nate Silver, a polling specialist and political blogger, as a bizarre response.

Wondering if the company had anything to hide, Silver, the proprietor of fivethirtyeight.com, stayed up all night keying all of Strategic Vision's poll results over the last four years into a Microsoft Excel spreadsheet.

To test the polls, Silver made use of a statistical truism. As he puts it, "Tell a human to come up with a set of random numbers, and they will be surprisingly inept at trying to do so." They unwittingly fall into nonrandom patterns.

Silver took the results of every Strategic Vision poll question — from more than 100 polls on political races and issues of every sort — and analyzed the "trailing digits" in the results. (If a poll found that one candidate led another by 52-48, the trailing digits were 2 and 8.)

If subdivisions fail to comply, Virginia won't provide maintenance and snowplow services, a big disincentive in a state where the government provides 83 percent of road services.

Virginia expects the new rules to relieve its strained infrastructure budget: through streets are more efficient and cheaper to maintain, and they take pressure off arterial roads that otherwise need to be widened. "It's about connecting land-use and transportation planning and restricting wasteful and unplanned development," Kaine said in March.

And how will the people respond who actually have to live and drive in the new, cul-de-sac-free neighborhoods? "There are pros and cons," says Kaid Benfield, the director of the Smart Growth Program at the Natural Resources Defense Council. "Residents like walkability and they like not having to be forced onto an arterial road where the traffic jam is. On the other hand, there is a sentiment out there that cul-de-sacs are safe" — though Benfield says research actually shows fewer traffic fatalities occur on connected roads. Other states are watching the Virginia rules closely, and Benfield says he expects to see similar regulations adopted around the country in the next few years — which means the dead end may soon be a thing of the past.

CLAY RISEN

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The probability of such a distribution occurring in authentic polls, Silver calculated, was "millions to one against."

Silver concluded that the firm's data were not random. "It's not close to random," he wrote. "It's not close to close."



NATE SILVER
ILLUSTRATION BY CATH RILEY

When readers asked for a comparison study, he presented a similar analysis for the well-respected Quinnipiac poll. In that case, there were "a few too many 2s and 3s," but nothing outside the realm of chance.

In the coup de grâce, a retired physics professor at the University of Illinois, Michael Weissman, stepped in, deploying more sophisticated tools (Fourier analysis). If Strategic Vision's polls were legitimate, Weissman concluded, the odds that they would produce the numbers Strategic Vision published were 1 in 5,000 — better than Silver found, but still suspicious. Strategic Vision has threatened to sue Silver, too, but the



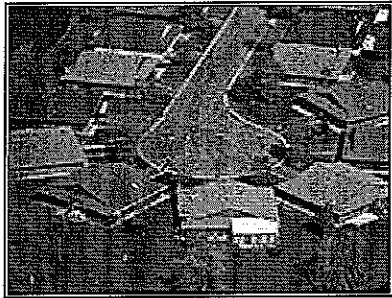
May 27, 2008

Environment

Cul-de-Sacs: Suburban Dream or Dead End?

by John Nielsen

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Urban planners, anti-sprawl activists and architects, as well as some city managers and mayors, are opposed to cul-de-sacs. But one important group is still in love with the cul-de-sac: homebuyers. Metropolitan Design Center Image Bank, Regents of the University of Minnesota

The Cul-de-Sac Myth

Authors William Lucy and David Phillips examine the myth that cul-de-sacs are safer places to live because they prevent through-traffic.

Read an excerpt from their book, *Tomorrow's Cities, Tomorrow's Suburbs*,

[Morning Edition, June 7, 2006](#) · Next time you take a plane flight, take a look out the window. If you're over a city, you'll see roads that form a grid connecting homes, offices and stores.

But if you are flying over the suburbs, you'll see roads that look like trees. The trunks are great big feeder streets with branches splitting off. At the ends of the branches are what look like circular leaves.

Those are the cul-de-sacs, the dead-end streets that have become a symbol of suburban life. Since the end of World War II, millions of cul-de-sacs have been built on the fringes of American cities.

The Lure of the Cul-De-Sac

In recent years, however, the cul-de-sac has fallen out of favor with urban planners and architects. Some cities have even banned them.

To understand why, I recently visited a cul-de-sac in Carderock Springs, Md., where I lived when I was in the sixth and seventh grades.

Traveling with me was Jeff Speck, an urban planner who works at the National Endowment for the Arts.

Behold "the American dream, circa 1960," he said, surveying my old neighborhood. "One, two, three, four, five houses surrounding a circular drive. Each house looks inward at the donut hole of plants in the middle. Each house is very carefully designed with windows on the front and back and not on the sides, so they don't really see each other."

Now, I had some trouble finding my own house because the trees are so much taller now. But some things haven't changed. First, you can still hear the rumble of traffic on the nearby freeway.

"And the other thing we hear are the birds," said Speck. "And that's actually the Scylla and Charybdis of the suburban condition. On the one hand, you do have this feeling of a close contact with nature, because you don't have cars going by every minute within the community. The only cars that come by are going to be the ones that are parking nearby."

Suburban Isolation

On the other hand, there's the problem of having to drive your car almost everywhere. Or, in Speck's words, the uneasy feeling that "your car is no longer an instrument of freedom but a prosthetic device."

Driving is the only way to get from a typical cul-de-sac to a restaurant, a store or your office. And on the roads that funnel back to that main trunk, the traffic is usually awful.

That is one reason urban planners such as Speck do not think much of cul-de-sacs. Neither do anti-sprawl activists, many architects and some city managers and mayors.

If these critics have a leader, it is probably William Lucy, a professor of environmental studies at the University of Virginia. He says a national debate is brewing about the future of the cul-de-sac.

~~"The era of the cul-de-sac is certainly threatened; it's a battleground," Lucy says. "The professionals tend to think that the connected neighborhood is the good neighborhood. And the developers and the realtors are more of a mixed mind."~~

Some of the earliest American cul-de-sac communities were built in Radburn, N.J., in the 1920s. By the mid-1950s, they were everywhere. Developers learned that cul-de-sacs allowed them to fit more houses into oddly shaped tracts, and to build right up to the edges of rivers and property lines.

"Going over the lines had two problems," Lucy says. "One, it was expensive to try to traverse the obstacles. Second, it made connection to other neighborhoods or other subdivisions, and that was contrary to the notion of safety."

Safety Hype

Lucy says safety has always been a big selling point for cul-de-sacs. From the beginning, builders noted that they gave fire trucks extra room to turn around, and that they prevented strange cars from speeding by on their way to somewhere else. Ads for cul-de-sacs often pictured children riding bikes and tricycles in the street.

These days, those images seem grimly ironic to people who actually look at safety statistics. For example, Lucy says cul-de-sac communities turn out to have some of the highest rates of traffic accidents involving young children.

"The actual research about injuries and deaths to small children under five is that the main cause of death is being backed over, not being driven over forward," he says. "And it would be expected that the main people doing the backing over would in fact be family members, usually the parents."

Armed with such arguments, critics of the cul-de-sac have won some victories in recent years. In cities such as Charlotte, N.C., Portland, Ore., and Austin, Texas, construction of cul-de-sac-based suburbs has basically been banned. In other places, cul-de-sac communities have been retrofitted with cross streets.

Safe in the American Dream

But one important group still appears to be in love with the cul-de-sac: homebuyers.

Theres Kellermann, a realtor who lives and works in Carderock Springs, says buyers still line up to live on dead streets.

"When I put ads in about a house that has just been listed, if it has a cul-de-sac I say: 'Cul-de-sac location -- location within location,'" says Kellerman. "It has no through street, [so] nobody will race by -- not even the teenagers that go on their little racing sprees, because they can't go anywhere."

A recent study backs up Kellerman. It showed that buyers will pay 20 percent more for a home on a cul-de-sac.

Even cul-de-sac critic Jeff Speck says he understands the attraction. In recent years, he's helped design some well-

known grid-like "new towns," where it is possible to walk to places like a corner store. But for some cul-de-sacs -- like the one in Carderock Springs -- Speck says he would do some extra driving.

"I am not embarrassed to say [that] if I could afford this I would happily raise a family in this environment," he says.

And Speck says this isn't just an American dream anymore. He says that in countries like the Philippines and China, and in parts of the Middle East, cul-de-sacs are fast becoming all the rage.

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NETWORKS OF COMPLETE STREETS

In many places built since the 1950s, roadway design usually means a system of widely spaced, large arterials fed by smaller roadways that rarely connect with each other. This system concentrates motorized traffic on a limited number of large roads, which causes longer, indirect trips and limits opportunities for alternate routes. Such a network makes it difficult for people who might walk, bike, or take public transportation because the indirect routes lengthen their trips and force them onto roads that are usually not designed for their safety or comfort. Public transportation also has a difficult time serving isolated neighborhoods with only one or two entry or exit points. So, people end up driving, even for very short trips.

Communities that have adopted complete streets policies sometimes struggle with retrofitting multi-lane arterials that must carry heavy automobile traffic but are also the only choice for bicycling, walking, and public transportation. Many realize they must look for opportunities to increase street connectivity in order to give people choices when traveling between home, medical offices, schools, shops, and workplaces.

Complete Streets Are Connected Streets

Well-designed, connected complete streets make travel more efficient by providing choice not only in modes, but also in routes. Pedestrians and public transportation riders are especially motivated to find direct routes to their destination or their transit stop, and prefer lower-traffic streets. This is much easier to do when the street network is a connected grid of relatively short blocks. Instead of trying to make each street perfect for every traveler, communities can create an interwoven array of streets that emphasize different modes and provide quality accessibility for everyone. Some streets may emphasize vehicles or trucks, while others emphasize pedestrians or public transportation. In more industrial areas, some streets will emphasize access for freight vehicles. Charlotte, North Carolina defines its street network along a continuum from most pedestrian-oriented to most auto-oriented, referring both to the design of the street and to the adjacent land uses. Each street type emphasizes different mixes of modes, but is designed with all potential travelers in mind.

In a complete network, short, local trips can be taken without burdening the arterial systems with more cars. Roads in sprawling communities see up to 75% more travel demand on those arterials than similar arterials in connected networks. People with a complete, connected network of options may opt to reach their destination entirely without driving on arterials, or will instead walk, bike, or take public transportation. One study found that single-family households located in a network of complete streets made a similar number of total trips as those in an incomplete network, but made significantly fewer by car, instead opting to walk.

Connected streets can reduce traffic congestion by dispersing traffic and offering travel options. Networks of connected complete streets can carry as many travelers as conventional sprawling roadway design, but do not rely on a sparse network of major arterials. Parallel routes within connected networks maintain this high corridor capacity, while providing different routes to destinations for convenience, variety, or to avoid construction. These choices help all users of the system by reducing travel delays associated with reliance on very few routes.

Connectivity Improves Safety

Grid networks help create a safer road system. A study of 24 medium-sized California cities found that the most cities were those built more recently with unconnected networks that concentrated auto traffic on a few roads and featured far fewer intersections. The more grid-like street networks saw fewer fatal or severe crashes. Gridded networks need not rely on overly-wide roads and have more intersections, lowering drivers' speeds. Yet travel times remain comparable to the conventional network because trip distances are shorter - the routes are more direct - and because timed traffic signals can provide a consistent speed. Pedestrians benefit from additional signalized, safe crossing opportunities at intersections, while both people afoot and on bike benefit from the slower vehicular speeds. Emergency service personnel are able to reach emergency sites more quickly due to the redundancy of the network. A study in Charlotte, North Carolina found that as street connectivity increased, a fire station could reach far more households, and more quickly.

Right-sized Blocks

A network of complete streets works best if block size is reduced. Short blocks are important to people on bikes or on foot because they reduce the total distance traveled and provide direct access to properties. A smaller block structure also allows land use to evolve and adapt over time, providing development flexibility. After updating its City Code to achieve complete streets, North Myrtle Beach, South Carolina now requires most blocks to be human-scaled, between 300 and 400 feet long. For transit providers, a community of complete streets with shorter blocks is easier to serve. Most agencies look for a ½ mile spacing between routes, which is more easily achieved with a grid system, as is easy travel in any direction.

Increase Connectivity with Complete Streets

Some places with Complete Streets policies have included provisions specifically to increase connectivity. For example, Virginia's Complete Streets policy was augmented by a new policy to end maintenance support for new streets that end in cul-de-sacs. Other communities have required new developments to connect into the existing grid in multiple locations. Some built-out communities with a sprawling road system have looked for opportunities to create more non-motorized connections by installing paths that connect cul-de-sacs and other disconnected streets to nearby roads. Even when roads are connected, there may still be a need for connected grids of walking and bicycling networks. The incorporation of Complete Streets into all of Seattle, Washington's plans helps to identify gaps in the network for different modes and prioritizes investment to create complete networks for all modes.

Reaching connectivity through Complete Streets policies directs transportation funding to create complete networks for all modes and helps support the livable communities that people want.

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SAFETY

Virginia Noll came home from grocery shopping in Wilkes-Barre, Pennsylvania on June 11, 2009. As she crossed South Washington Street around 5:30 pm from the bus stop to the senior housing apartments where she lived, she was fatally struck by an SUV. The area is particularly dangerous for older adults, despite the high number living in the area. Her neighbor had warned her not to go out, fearing the 88-year-old would be hit while crossing a street.

Incomplete streets put people at risk

Streets without safe places to walk, cross, catch a bus, or bicycle put people at risk. Over 5,000 pedestrians and bicyclists died on U.S. roads in 2008, and more than 120,000 were injured. Pedestrian crashes are more than twice as likely to occur in places without sidewalks; streets with sidewalks on both sides have the fewest crashes. While the absolute numbers of bicyclists and pedestrians killed has been in decline for the decade, experts attribute this in part to a decline in the total number of people bicycling and walking.

Of pedestrians killed in 2007 and 2008, more than 50% died on arterial roadways, typically designed to be wide and fast. Roads like these are built to move cars and too often do not have meet the needs of pedestrian or bicyclist safety. More than 40% of pedestrian fatalities occurred where no crosswalk was available.

A recent study comparing the United States with Germany and the Netherlands, where complete streets are common, found that when compared per kilometer traveled, bicyclist and pedestrian death rates are two to six times higher in the United States. Complete streets therefore improve safety indirectly, by encouraging non-motorized travel and increasing the number of people bicycling and walking. According to an international study, as the number and portion of people bicycling and walking increases, deaths and injuries decline. This is known as the safety in number hypothesis: more people walking and biking reduce the risk per trip.

Complete Streets help reduce crashes

Complete streets reduce crashes through comprehensive safety improvements. A Federal Highway Administration review of the effectiveness of a wide variety of measures to improve pedestrian safety found that simply painting crosswalks on wide high-speed roads does not reduce pedestrian crashes. But measures that design the street with pedestrians in mind - sidewalks, raised medians, better bus stop placement, traffic-calming measures, and treatments for disabled travelers - all improve pedestrian safety. Some features, such as medians, improve safety for all users: they enable pedestrians to cross busy roads in two stages, and reduce left-turning motorist crashes to zero, a type of crash that also endangers bicyclists.

One study found that designing for pedestrian travel by installing raised medians and redesigning intersections and sidewalks reduced pedestrian risk by 28 percent. Speed reduction has a dramatic impact on pedestrian fatalities. Eighty percent of pedestrians struck by a car going 40 mph will die; at 30 mph the likelihood of death is 40 percent. At 20 mph, the fatality rate drops to just 5 percent. Roadway design and engineering approaches commonly found in complete streets create long-lasting speed reduction. Such methods include enlarging sidewalks, installing medians, and adding bike lanes. All road users - motorists, pedestrians and bicyclists - benefit from slower speeds.

Complete streets encourage safer bicycling behavior. Sidewalk bicycle riding, especially against the flow of adjacent traffic, is more dangerous than riding in the road due to unexpected conflicts at driveways and intersections. A recent review of bicyclist safety studies found that the addition of well-designed bicycle-specific infrastructure tends to reduce injury and crash risk. On-road bicycle lanes reduced these rates by about 50%.

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[All fact sheet citations are available in the downloadable files]

Additional Resources:

[Dangerous by Design: Solving the Epidemic of Preventable Pedestrian Deaths \(and Making Great Neighborhoods\)](#)
Transportation for America and the Surface Transportation Policy Project, 2009

[Evaluation of Lane Reduction "Road Diet" on Crashes \(.pdf\)](#)
FHWA Highway Safety Information System, 2010

[Section 402 - the State and Community Highway Safety Grant Program](#)
League of American Bicyclists, 2009

[Who Owns the Roads? How Motorised Traffic Discourages Walking and Bicycling.](#)
Peter Jacobsen et al., 2009

[Urban Sprawl and Delayed Ambulance Arrival in the U.S.](#)
Matthew J. Trowbridge, Matthew J. Gurka, and Robert E. O'Connor, 2009

[Relationship of Lane Width to Safety for Urban and Suburban Arterials \(.pdf\)](#)
Midwest Research Institute

[Amendments to the International Fire Code](#)
Congress for the New Urbanism

[The impact of transportation infrastructure on bicycling injuries and crashes: a review of the literature.](#)
Conor C O Reynolds, M. Anne Harris, Kay Teschke, Peter A. Crompton, and Meghan Winters

[Traffic Safety Fact Sheets](#)
National Highway Traffic Safety Administration

COSTS OF COMPLETE STREETS

An oft-raised concern about Complete Streets is the fear of additional costs when requiring accommodation for all modes of travel. However, jurisdictions implementing a complete streets policy within a balanced and fiscally sound budget find that it adds little to no expense to their transportation budgets. Complete streets are more cost effective than the alternative - streets made only for cars. In some cases, complete streets can even help jurisdictions save money. They are long-term investments in the overall health of communities who adopt policies

Help Prevent Costly Delays and Retrofits

Integrating the needs of all users - pedestrians, bicyclists, public transportation riders, motorists, older people, children, and people with disabilities—early in the life of a project minimizes costs associated with including facilities for these travelers. Complete streets policies ensure early multi-modal scoping, saving money by avoiding costly project delays. Without a policy, bicycle, pedestrian, and public transportation accommodations are often debated too late in the design process and are considered a disruption rather than necessary and beneficial project features. This creates expensive design revisions, time delays and erodes public support. Furthermore, the failure to accommodate these user groups can trigger an expensive retrofit project at later date. A bridge near Cary, Illinois was built in the early 1990s without any safe way to cross it via foot or bicycle. After several deaths and a successful wrongful-death lawsuit, Illinois DOT was forced to go back at a great expense (\$882,000) to retrofit the existing bridge with a side path. It would have been far less expensive to construct the bridge correctly initially.

“When projects are scoped and programmed without consideration for complete streets, there could be extra cost over the original estimate in order to later address pedestrian, bike, and bus features.”

- Gregg Albright, Deputy Director of Planning and Modal Programs, Caltrans

Require Minimal to Zero Additional Funding

The careful planning encouraged by complete streets policies helps jurisdictions find many effective measures that can be accomplished at little or no extra cost. Some standard infrastructure projects, such as conversion from open to closed drainage, can be enhanced with complete streets facilities (i.e. sidewalks) for negligible additional cost. Changing pedestrian signal timing at intersections to a 3.5 ft/sec walking speed adds nothing to the cost of a signal, and adding countdown clocks can be done for as little as \$2000 per intersection. Adding curb bulbs where on-street parking occurs reduces the time for pedestrians to cross the street, allowing more time for automobile movement; this can be a relatively low cost way to improve both pedestrian and automobile access. Additional costs associated with the routine accommodation of bicycling, walking, and public transportation represent an immeasurably small percentage of the total budget. On a project-by-project basis, any additional money spent is actually a long-term investment in the financial and physical health of the community.

Save Money through Better Design

Communities who adopt complete streets policies commit to superior roadway planning and design in new and reconstruction projects. Executing these designs can be less expensive than projects carried out under old standards and policies. In a reconstruction project, the Brown County, WI Highway Department built a three-lane street with two bike lanes on the existing four-lane roadway, and replaced expensive traffic signals with roundabouts. These changes saved the County \$347,515 - 16.5% below the original project estimate. Creating complete streets also reduces infrastructure costs by requiring far less pavement per user; this saves money at the onset of the project and reduces maintenance costs over the long-term. Compared to increasing road capacity for vehicles alone, investing in pedestrian and bicycle facilities cost far less; over the width of one traffic lane, walking and cycling can move five to ten times more people than driving. Neighborhood streets built in a grid to serve all users reduce the need for wide automobile lanes and complex intersections, and can lower infrastructure costs 35-40% compared to conventional suburban development. Complete streets policies help with long-term savings for public transportation as well. The Maryland Transit Administration found providing curb-to-curb transit service for a daily commuter with disabilities costs about \$38,500 a year. Investing in one-time basic improvements can enable that commuter and several more to access an existing fixed-route public transportation route; this singular cost is the equivalent of two months' worth of the curb-to-curb service for just one person. More extensive improvements, such as adding a lighted shelter and bench and replacing the sidewalk leading to the stop, have a one-time cost just 33% more than a year of curb-to-curb service for a single commuter.

“If a roadway is being reconstructed, rebuilding the roadway with 10-foot lanes and timing the traffic signals for 30mph will control speeds and can actually result in a reduction in costs by using a narrower overall roadway structure.”

- John LaPlante, PE, PTOE Director of Traffic Engineering for T.Y. Lin International, former City Traffic Engineer with the City of Chicago

Investment in the Community

Complete streets are a sound financial investment in our community that provides long-term savings. An existing transportation budget can incorporate complete streets projects without requiring additional funding, accomplished through re-prioritizing projects and allocating funds to projects that improve overall community mobility. In such a balanced and fiscally sound transportation system, complete streets facilities should not be treated as additional costs to a project.

Complete streets provide benefits to the community in many other ways, from public health to sustainability and from improved property values and economic revitalization to increased capacity and improved mobility for all. Americans expect a variety of choices, and a multi-modal system of complete streets provides alternatives to driving. Implementing complete streets allows for an efficient and optimal use of limited resources: time, fuel, land, public health, the environment, and money

“Boulder’s complete streets approach has transformed how we look at our transportation system. The city leaders made a conscious decision to provide multimodal options, and have focused on our investments accordingly. We believe this is a sound financial approach to increasing mobility and supporting the quality of life enjoyed by those who live and work in Boulder.”

CHANGE TRAVEL PATTERNS

Boulder, CO has been completing its streets since the early 1990s, with over 380 miles of dedicated bike facilities, paved shoulders, and a comprehensive transit network. Between 1990 and 2006, fewer people in the city drove alone, more people walked or bicycled, and transit trips nearly doubled.

Incomplete streets discourage getting out of the car

The 2009 National Household Transportation Survey found that 50% of all trips are three miles or less and 28% of all trips are one mile or less - distances easily traversed by foot or bicycle. Yet 60% of trips under one mile are made by automobile, in part because of incomplete streets that make it dangerous or unpleasant to walk, bicycle, or take transit

Surveys have found that a lack of sidewalks and safe places to bike are a primary reason people give when asked why they don't walk or bicycle more. A national poll found 47% of Americans over 50 said they could not cross main roads near their home safely. Almost 40% said their neighborhoods do not have adequate sidewalks, while another 55% reported no bike lanes or paths, and 48% reported no comfortable place to wait for the bus.

Similarly, a study conducted in King County, Washington found that walking and public transportation use is less prevalent in the areas with low street connectivity and a limited variety of destinations. Residents in those areas drove 26% more miles than Washingtonians living in more walkable areas. About one third of Americans live in communities without sidewalks; if they were to walk at the same rate as those in communities with sidewalks, an additional 2.8 million adults would be out walking.

Complete Streets increase use of public transportation, bicycling, and walking

Between 1991 and 2008, Portland expanded its bicycle network 250%, increasing from roughly 75 to 275 total bikeway miles. During the same period, ridership increased 490% as measured by collecting daily counts over four main bridges. Ridership counts continue to increase even as the number of bikeway miles levels off.

Completing the streets for people who are walking, bicycling, and taking public transportation does more than make the roads safe for existing users - more people begin to choose to leave their cars in the driveway. A recent review of studies comparing highly walkable and poorly walkable neighborhoods found that residents of the former reported approximately two times more walking trips per week than the latter. Furthermore, there is a synergistic relationship between transit use and neighborhood walkability. Residents of King County, WA living in walkable neighborhoods - with good street connectivity and a greater mix of land uses - use public transportation more than those who do not live in such walkable areas.

For typical U.S. cities with populations over 250,000, each additional mile of bike lanes per square mile is associated with a roughly one percent increase in the share of workers commuting by bicycle. Increasing the share of workers commuting by bicycle by one percentage point would double the average number of bicycle commuters in many cities.

Rapid transit bus service that operates on streets improved to speed bus travel can increase ridership and shift trips from cars. Rapid bus service in Los Angeles slashed travel times by 25 percent. Within one year, ridership soared by 30 percent. The Orange Line in particular, outperformed its first year ridership projections by attracting roughly 22,000 weekday boardings after only seven months of service. The California Center for Innovative Transportation found a 7% increase in traffic flow during morning rush hour and a 14% decrease in total time spent in congestion since the Orange Line began operating.

Innovations such as 'road diets' have had a clear impact on travel patterns. In 1999, Valencia Street in San Francisco was converted from a four-lane road to a three-lane road with a center turn lane and bicycle lanes. One year after the conversion, a study by the city found that bicycle volume increased 144% on Valencia Street during the afternoon peak period; collisions decreased. A similar road diet on Edgewater Drive in Orlando resulted in a 23% increase in pedestrian traffic, a 30% increase in bicycle traffic, and automobile travel delays increased by only 10 seconds during the morning peak.

More children are likely to walk or bike to school when sidewalks or footpaths are present, when there are safe street crossings, and when reduced vehicle speed are enforced in school zones. Safe Routes to School programs, which include completing streets around schools, increased the number of children walking to school. The California program, initiated through legislation in 1999, was an immediate success, with more kids walking to school, reduced traffic speeds near schools, and more drivers yielding to pedestrians.

Availability of and access to bike paths and footpaths are associated with greater levels of physical activity. A study spanning seven countries found five environmental factors significantly related to the amount of physical activity in which residents engaged. Three involved complete streets: sidewalks on most streets, transit stops nearby, and the presence of bicycle facilities. The more factors that were present, the higher the activity level of residents. Advocates who fought hard for inclusion of a bicycle-pedestrian path on the new Ravenel Bridge in South Carolina commissioned a study of the now wildly popular path. Two-thirds of the path's users getting more exercise since the bridge path opened.

DOWNLOAD: [pdf](#) | [doc](#)

[all citations are available in the downloadable files]

Additional Resources:

[Encouraging Bicycling and Walking: The State Legislative Role](#)
National Conference of State Legislators

[Active Transportation for America](#)
Rails-to-Trails Conservancy, 2008

CREATE LIVABLE COMMUNITIES

The streets of our cities and towns are an important part of the livability of our communities. They ought to be for everyone, whether young or old, motorist or bicyclist, walker or wheelchair user, bus rider or shopkeeper. But too many streets are designed only for speeding cars, or worse, creeping traffic jams. They are unsafe for people on foot or bike - and unpleasant for everybody.

Incomplete streets deny citizens safety, choice

Most of us think of America as the land of choices. Yet, in just about any community built in the last 50 years, there is only pretty much one choice for transportation: the car. The more sprawling our communities - low density, scattered development linked by busy, high-speed, multi-lane roadways - the more we are limited to our cars.

Even where daily destinations are close to home, incomplete streets too often make them inaccessible by foot, bicycle, or public transportation. They are cut off by cul-de-sacs that increase walking distance, or by high-speed roads lacking bike lanes, sidewalks, comfortable transit stations, or safe crossings. While some streets do provide a safe pedestrian environment, it may not be a pleasant one - the absence of benches, scarce landscaping, and storefronts set back from the sidewalk do little to encourage walking.

The heavy reliance on driving has an impact far beyond today's traffic jam. People of color, who are less likely to own cars and more likely to rely on public transportation, are particularly affected by poor development patterns. Working families who own a car are burdened with associated expenses: purchase cost, maintenance, registration fees, fuel, and others.

Streets designed solely for automobile travel also put people at risk. In 2007, there were 4,654 pedestrian deaths and 70,000 reported pedestrian injuries - that's nearly one every eight minutes. In a poll of people over 50 years old, 47 percent said it was unsafe to cross the street near their home. In neighborhoods where traffic is a nuisance and a threat, residents both young and old are more inclined to stay in their homes. This limits much needed physical activity and social interaction.

Complete streets foster livable communities

Communities are increasingly embracing smart growth to meet their residents' desire for choices in housing, shopping, recreation, and transportation. Complete streets meet the demand for transportation options, while promoting other community goals. They provide safe and affordable access for everyone, whether traveling to school, work, the doctor, or their favorite restaurant.

More than half of Americans recently surveyed would like to walk more and drive less. Poor community design and lack of pedestrian facilities are the primary reasons people cite for not walking more. An overwhelming number support policies intended to make their communities more livable by reducing traffic speed and creating a safer pedestrian environment.

Complete streets contribute many benefits to the surrounding community:

- Wide, attractive sidewalks and well-defined bike routes, where appropriate to community context, encourage healthy and active lifestyles among residents of all ages.
- Complete streets can provide children with opportunities to reach nearby destinations in a safe and supportive environment.
- A variety of transportation options allow everyone - particularly people with disabilities and older adults - to get out and stay connected to the community.
- Multi-modal transportation networks help communities provide alternatives to sitting in traffic.
- A better integration of land use and transportation through a complete streets process creates an attractive combination of buildings - houses, offices, shops - and street designs.
- Designing a street with pedestrians in mind - sidewalks, raised medians, better bus stop placement, traffic-calming measures, and treatments for travelers with disabilities - may reduce pedestrian risk by as much as 28 percent.
- A livable community is one that preserves resources for the next generation: complete streets help reduce carbon emissions and are an important part of a climate change strategy.

In San Diego, where a number of complete streets policies are in place, the La Jolla neighborhood saw its namesake boulevard become something more than an uninteresting strip of shops after recent roadwork. Today, the street is vibrant and alive, with pedestrians, bicyclists, and shoppers. Despite the economic meltdown, the street is outperforming on every factor, from numbers of bicyclists and pedestrians to number of smiles. Communities are also investing in complete streets as a way to attract new residents and young professionals.

Complete streets transform the way transportation serves the American people by creating more choices, shortening travel times, and encouraging less carbon-intensive transportation. A community with a complete streets policy values the health, safety, and comfort of its residents and visitors. These policies provide opportunities for people of all ages and abilities to contribute to, and benefit from, a livable community.

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[all citations are available in the downloadable files]

Additional Resources:

[Smart Growth America](#)

[U.S. Environmental Protection Agency Smart Growth](#)

[Smart Growth Network](#)

SUSTAINABLE COMPLETE STREETS

Communities across the country are realizing the 'green' potential of their streets. Making our transportation system more sustainable involves many policies and practices that minimize environmental impact and create streets that are safe for everyone, regardless of age, ability, or mode of transportation. Complete streets are a natural complement to sustainability efforts, ensuring benefits for mobility, community, and the environment.

Many elements of street design, construction, and operation can work in favor of achieving both complete streets that work for all travelers and 'green' streets that serve environmental sustainability. Of particular concern are drainage and stormwater runoff issues too common in traditional streets. Optimal stormwater management looks beyond simply removing rainfall as quickly as possible, which risks negative environmental impacts associated with both stormwater quality and quantity, like polluted runoff, sedimentation, and bank erosion. Instead it focuses on efforts to retain and treat - or even eliminate - runoff at the source through cost-effective green infrastructure, improving water quality and complementing complete streets efforts.

Pavement

Wide streets are problematic for mobility and ecology - they can be unpleasant or, worse, unsafe, for anyone traveling along or across via foot or bicycle and the large swaths of impervious pavement necessitate expensive drainage and treatment systems that can have harmful effects on water quality and quantity. Drainage facilities can affect pedestrians, bicyclists, and public transportation users in various ways as well. Poorly maintained systems create puddles that splash pedestrians and those waiting in bus shelters and that are hazards for bicyclists, hiding potential cracks that could spell rough spills.

When a complete streets policy is carefully followed, considering community context and needs, the issues of too-wide streets can be addressed while also increasing access for all travelers. Many communities are narrowing travel lanes, swapping one automobile lane for two bike lanes (a 'road diet'), or taking other measures to provide safe space for bicyclists, pedestrians, and public transportation - without widening roads. In some cases, this can mean including only one sidewalk, as it did on residential 2nd Avenue in Seattle, Washington where a relatively low volume of pedestrians and slow vehicular speeds made this solution possible. Some cities are investing in pervious surfaces, such as pervious asphalt and concrete, pervious pavers, and reinforced gravel paving, can be used on complete streets once it has been determined the surfaces will not compromise pedestrian and bicyclist access and safety. Furthermore, communities can look to maximize pavement albedo (reflectivity) to reduce the urban heat island effect, improve air quality, increase pavement durability, and improve nighttime illumination.

Landscaping

Landscaping elements that help curb stormwater runoff - bioswales, planters, rain gardens, and street trees - are mutually beneficial for mobility and ecology. Such green elements are increasingly found to be important deterrents of crashes and injuries, and contribute to a more comfortable and visually interesting environment for all users. When redesigning streets, project managers can include plants and trees (most likely requiring amended soils) to clean runoff and manage stormwater at the site. Traffic-calming elements like chicanes, islands, and curb extensions - all popular in creating complete streets - provide site opportunities for bioswales, street trees, and rain gardens.

Centrally located in Seattle, the Taylor 28 residential mixed-use project included a zero-discharge streetscape with each planting area serving as a rain garden. Curb extensions are home to some of these rain gardens, and also help to slow traffic, allowing bicyclists a safer ride. Numerous trees reduce the heat island effect and offset CO₂, while widened sidewalks and increased pedestrian features make the street friendlier to those walking by. Such improvements complement the City's own complete streets policy.

Climate

Of course, complete streets make their most basic contribution to green streets by providing space along the right-of-way for low-emission travel. In the United States, transportation is a significant source of greenhouse gas (GHG) emissions - in fact, it accounted for 28% of total U.S. GHG emissions in 2006. The largest source of transportation GHG emissions is personal cars and trucks. Complete streets policies are an essential tool in providing transportation choices beyond the personal automobile. Walking and bicycling for the shortest trips (less than 1 mile), rather than taking a car, could reduce CO₂ emissions - a major GHG - by 12 to 22 million tons per year in the U.S. Replace the car with walking and biking for longer trips (1-3 miles), and the CO₂ savings come to 9 to 23 million tons annually. Add in the benefits of access to public transportation ridership - which is already cutting CO₂ by 37 million metric tons every year - and the environmental benefits of complete streets are astounding.

Complete streets, in conjunction with green infrastructure, is a tremendous opportunity to improve the livability of our communities, both now and for future generations.

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[all citations are available in the downloadable files]

Additional Resources:

[Managing Wet Weather with Green Infrastructure](#)
U. S. Environmental Protection Agency

[Better Streets Policy & Plan](#)
City and County of San Francisco

[Designing Our Future: Sustainable Landscapes](#)
American Society of Landscape Architects