Lane reduction can increase safety for pedestrians, bicyclists, and motorists while improving the quality of life in downtowns across the country.

Have you ever had a problem walking across a street because you felt it was too wide or had too many lanes to cross comfortably? Have you ever wanted to ride your bicycle to your destination but felt uncomfortable because the direct route lacked bike lanes? Have you ever been through a downtown that seemed drab, dull, lifeless?

You're not alone. Pedestrians generally have difficulty crossing wide roads that have multiple lanes in both directions. In some areas, crossing opportunities for pedestrians are located only at signalized intersections that are spaced at uncomfortable walking distances. In some cases, the number of lanes may be unnecessary for the actual volume of motor vehicle travel. Some roads with lower traffic volumes might be good candidates for bicycle travel, but bicyclists avoid them because of the lack of dedicated bike lanes.

Historically, adding more lanes has been one of the preferred solutions for reducing traffic congestion. In some downtown areas, however, accommodations such as adding lanes and removing parking spaces have resulted in fewer opportunities for people to stop and shop, reducing business for retail stores.

One approach that engineers and planners use to address these problems is the road diet. Not only can this tactic improve pedestrian and bicyclist mobility and revitalize a downtown, but also it can increase safety by reducing conflicts between motor vehicles.

**What Is a Road Diet?**

The road diet approach involves narrowing travel lanes or shoulders or eliminating some of them to provide more space for pedestrians and bicyclists. A typical road diet consists of converting a four-lane roadway (two in each direction) to a three-lane (one in each direction plus a center...
turn lane) and adding sidewalks and/or bicycle lanes. At times, this reconfiguration can be accomplished by simply restriping the lanes in conjunction with a resurfacing project.

Peter Lagerwey, former coordinator of Seattle's pedestrian and bicycle program and now senior planner with the Toole Design Group, sees street rights-of-way as an urban resource that various users are competing for. The rights-of-way provide space for general-purpose lanes, turning lanes, bus and bicycle lanes, parking, sidewalks, buffers, street plantings, and outdoor restaurants. "Roads are to serve all of us," says Lagerwey. "Streets exist 24/7, but peak traffic may be a concern for as little as 30 minutes a day. If you build to peak traffic, you are going to have excess capacity. The good news is that we have overbuilt many of our roadways, and we have a lot of opportunities to do road diets."

Gabe Rousseau, bicycle and pedestrian program manager for the Federal Highway Administration (FHWA), notes, "Road diets offer a number of community benefits from increasing roadway safety to improving mobility for pedestrians of all ages and abilities, and even helping with traffic congestion."

**Benefits**

In theory, road diets have potential drawbacks, but in fact, case studies in a number of States suggest that problems usually do not occur. Instead, this approach offers a number of benefits in terms of traffic operations, safety, and livability when applied in the appropriate situations.

**Operations.** On a four-lane street, speeds can vary between lanes. Due to slower vehicles stopped in the left lane waiting to make a turn, drivers must slow or change lanes. On the other hand, road diet streets with two through lanes plus a center turn lane separate left-turning vehicles from the through vehicles. The speeds of motorists in the through lanes are limited only by the speed of the lead vehicle in their own lanes.

**Safety.** The reduction in vehicle interactions resulting from a road diet potentially can decrease the number and severity of crashes. Typical incidents that occur on four-lane streets include rear-end crashes from left turns, side swipes, left turn/broadside, and multiple-threat crashes in which a vehicle stopped for a pedestrian blocks the view of the driver in the adjacent lane. Reducing the number of through lanes and providing a center turn lane addresses these crashes by (1) separating left-turning traffic from through traffic, (2) reducing the number of oncoming lanes through which a left-turning driver must search for a gap, and (3) removing the multiple-threat situation because there is no longer an adjacent lane. (See, for example, http://guide.saferoutesinfo.org/engineering/tools_to_reduce_crossing_distances_for_pedestrians.cfm.)

A Highway Safety Information System (HSIS) summary documents research that analyzed data from California, Iowa, and Washington State used in earlier separate road diets safety evaluations. Their study, summarized by FHWA in Evaluation of Lane Reduction "Road Diet" Measures on Crashes (FHWA-HRT-10-053), measured crash reductions of 47 percent on predominantly U.S. and State routes in small urban areas (average population: 17,000) and 19 percent on corridors in suburban areas surrounding larger cities (average population: 269,000).
to cross, again decreasing the potential for incidents. The center left-turn lanes also provide space for pedestrian crossing islands, which reduce crossing distances and can help prevent motorists from using the center turn lane as a passing lane.

The new street environment created by a road diet enables motorists to be more aware of the presence of pedestrians and bicyclists. Changing the environment of a street to one where motorists are expecting to see bicyclists and pedestrians can make it safer for those users.

One of the foremost reasons for increased safety from road diets is the reduced instances of speeding. Road diets encourage motorists to drive at the desired speed of the roadway.

Livability: If sufficient space is available, highway agencies can add street trees along the sidewalks for aesthetics. According to Lagerwey, street trees change the feel and character of a street. After a road diet and addition of landscaping, the messaging given by a street is: Slow down, this is a neighborhood, a place to respect bicyclists and pedestrians. Overall, road diets can lead to an improvement in livability, making walking and bicycling in downtown areas more pleasant. Other benefits include the economic impacts on businesses of a street that caters to all users, as well as increases in real estate values.

**Edgewater Drive in Orlando**

In January 2000, the city council of Orlando, FL, adopted the Neighborhood Horizon Plan governing future improvement projects for the city’s College Park neighborhood. The previous year, the residents of College Park had participated in workshops with the city to formulate the official plan.

The vision described in the Horizon Plan was to reinvent College Park’s Edgewater Drive into a vibrant, pedestrian-friendly commercial area with cafes and shops. The plan identified improvements such as placing utilities underground, installing new crosswalks enhanced with pavers at various crossing points, and calling for new traffic signals, safer parking, bicycle lanes, and wider sidewalks.

The 1.5-mile (2.4-kilometer) section of Edgewater Drive from Par Street to Lakeview Drive serves as
the main street through College Park, with an average daily traffic (ADT) of 20,000 at the time of the project. Edgewater Drive’s previous four-lane configuration did not allow sufficient room for streetscaping and other Horizon Plan improvements. The plan’s authors concluded that the only way to create wider sidewalks and a more pedestrian-friendly commercial district was to eliminate one vehicle lane. Since the Florida Department of Transportation (FDOT) already had budgeted to resurface Edgewater Drive in 2001–2002, the College Park Neighborhood Association asked the city to restripe the road from four lanes to three during the resurfacing.

FDOT was amenable to the road diet provided that the city would take over jurisdiction of that section of Edgewater Drive, the neighborhood and business associations would accept the proposed changes, and the city would conduct a before-and-after study to evaluate the effectiveness of the implemented changes. Some sections of Edgewater Drive were already under the jurisdiction of the city of Orlando. The neighborhood residents viewed the transfer of jurisdiction to the city as important because then the city could better implement improvement to the entire Edgewater Drive corridor as defined in the Neighborhood Horizon Plan without having to coordinate with FDOT. For the study, researchers used an average of 3 years of “before” data and 4 months of “after” data annualized to 1 year. The researchers examined crash rates, vehicle speeds, and traffic volumes.

The road diet reduced crash rates by 34 percent and injury rates by 68 percent per million vehicle miles driven on the segment of Edgewater Drive that received treatment. Before the road diet, this section experienced a crash every 2.5 days (146 crashes per year) and, after the road diet installation, a crash every 4.2 days (87 crashes per year).

The researchers measured vehicle speeds at three locations along the corridor (northern end, middle, and southern end) under the before-and-after conditions. The percentage of vehicles traveling at excessive speeds, defined by the researchers as over 36 miles per hour (mi/h) (60 kilometers per hour, km/h), showed a reduction in all three segments. Although the middle section experienced only a slight decrease in excessive speeds, the northern and southern segments showed noticeable reductions of 8 and 10 percent.

Traffic volumes for all users actually increased. Initially, the volume for motor vehicles decreased from 20,500 to 18,100 immediately after the road diet treatment. However, the volume eventually increased to 21,000. Lagerwey attributes initial decreases to motorists taking another route out of fear of increased congestion. “Then they discover that the road diet works really well, and they come back,” he says.

In terms of pedestrian volumes, the city’s researchers counted walkers at various locations and in both north-south and east-west directions. Overall, the increase in total pedestrian traffic was 23 percent, from 2,136 to 2,632 pedestrians per day. The largest increase of 738 to 1,151 pedestrians per day (56 percent) was in the number of pedestrians traveling east-west (crossing Edgewater Drive), indicating that they may have found the three lanes easier to cross than the previous configuration.

As with the pedestrian counts, the researchers took bicycle counts at various locations in both directions. The overall increase in bicycle volume, from 375 to 486 bicycles per day, was 30 percent, with the largest increase of 80 to 118 bicycles per day (48 percent) similarly in the east-west direction.

**Stone Way North in Seattle**

For almost three decades, Seattle, WA, has implemented road diets in an effort to improve the city’s streets and encourage walking, bicycling, and transit use. Since 1972, the Seattle Department of Transportation (SDOT) has installed 29 road diets. SDOT completed five in 2010, planned five more for installation in 2011, and is determining the feasibility of another two for 2012.

In 2007 Seattle passed a Complete Street Ordinance that required SDOT to plan, design, and construct new transportation improvements to accommodate pedestrians, bicycles, and transit while promoting safe operation for all users. In addition, the ordinance requires SDOT to incorporate complete streets principles into its transportation strategic plan, pedestrian and bicycle master plans, transit plan, and various other SDOT plans, manuals, rules, and regulations. Complete streets is a nationwide movement to design and build road networks that are welcoming to everyone: young and old, motorist and bicyclist, walker and wheelchair user, bus rider and shopkeeper.

For a corridor to be considered as a candidate for a road diet, SDOT requires that it be identified in the city’s list of complete streets capital.
projects or its pedestrian or bicyclist master plans. Another approach is for the candidate street’s residents to request a road diet as part of the implementation of their neighborhood improvement plan. SDOT considers the following facets of transportation operations, mobility, and safety in the selection of a road diet corridor:

- Volume of traffic—less than 25,000 vehicles per day
- Number of collisions—all modes (motor vehicle, pedestrian, bicycle)
- Vehicle speed
- Number of lanes
- Freight usage
- Bus stops and routing
- Travel time
- Accessibility

Common stakeholder concerns include increased congestion, diverted or cut-through traffic leaving the treated road for other neighborhood streets, and impeded exits from driveways. As for congestion, SDOT has found an actual gain in efficiency by removing left turns from travel lanes.

In terms of the second concern, SDOT monitors traffic through the affected neighborhood pre- and post-implementation to determine whether diverted traffic causes a problem. “Increasing traffic on neighborhood streets always comes up as a worry,” says Lagerwey. “But it’s just something that doesn’t happen with road diets. People stay on the street.”

On the third concern, left-turn access from side streets and driveways is improved because motorists now have only one travel lane to traverse to reach the center two-way left-turn lane. Left turns into driveways and side streets are facilitated because drivers have only one opposing lane of traffic to cross and sight distance is improved.

SDOT conducts followup studies to determine the effects on each treated corridor. Specifically, the department compares the before-and-after conditions for the following:

- Volume of the principal street’s peak hour capacity
- Speed and collisions
- Traffic signal level of service
- Volume of traffic on parallel arterials
- Travel times
- Bicycle volumes

In 2008, SDOT implemented a road diet on a 1.2-mile (1.9-kilometer) section of Stone Way North from N 34th Street to N 50th Street. In addition to serving motor vehicles, this segment of Stone Way North helps connect a bicycle path with a park. Within five blocks are eight schools, two libraries, and five parks.

The segment that was modified was originally a four-lane roadway carrying 13,000 vehicles per day. It had parking on both sides, a posted speed limit of 30 mi/h (48 km/h), and four uncontrolled, marked crosswalks that were noncompliant under SDOT’s 2004 revised crosswalk guidelines. For this corridor, the city’s 2007 bicycle master plan recommended climbing lanes and shared lane markings (previously known as “sharrowes”). The road diet cross section became two lanes plus a two-way left-turn lane, bicycle lanes, and parking on both sides. Reducing the number of motor vehicle travel lanes made the four crosswalks compliant.

Speeds decreased after the road diet installation. The 85th percentile speed was 37 mi/h (60 km/h) prior to the road diet. In the northbound direction, the 85th percentile speed dropped to 36 mi/h (58 km/h) and, in the southbound direction, 34 mi/h (55 km/h). Three percent of vehicles traveled at 40 mi/h (64 km/h) and faster prior to the road diet. Less than 1 percent traveled at 40 mi/h and faster afterwards.

Average daily traffic (ADT) dropped 6 percent, which was consistent with a citywide trend between 2006 and 2008. Peak hour volume dropped approximately 5 percent. Offpeak volume actually increased south of 45th Street by 2 percent.

Bicycle volume increased 35 percent, representing almost 15 percent of the peak hour traffic volume. Traffic did not divert after restriping, as indicated by the fact that volume did not increase on the four nonarterial streets commonly known as alternatives to Stone Way North.

A comparison of 2 years of crash data before (2006–2007) and after (2008–2009) the installation showed an overall decline in incidents. Total crashes decreased 14 percent, injury crashes went down by 33 percent, and angle crashes dropped by 56 percent. Bicycle crashes showed no change, but the rate decreased because the number of cyclists increased. Pedestrian crashes declined 80 percent.

**Other Case Studies**

A number of additional case studies on road diets confirm the results.
from Stone Way North and Edgewater Drive as typical. At the 2005 international meeting of the Institute of Transportation Engineers (ITE), Jennifer A. Rosales, P.E., formerly lead transportation engineer at Parsons Brinckerhoff and now senior program officer, public transportation engineer, with the Transportation Research Board, presented case studies from three States.

A road diet project in Vancouver, WA, reduced crashes by 52 percent on an arterial with ADT of 17,000 vehicles. Traffic speeds went down 18 percent, traffic diversions did not occur, and an overwhelming majority (67 percent) of users surveyed felt safer.

A road diet conversion in Athens, GA, on an arterial with 20,000 ADT resulted in crashes going down 53 percent in general and 60 percent at unsignalized locations. Traffic diversion was less than 4 percent, and 47 percent of users perceived the number of lanes and street width as “just right.” Another 33 percent were unsure, and only 20 percent were unhappy.

In Clear Lake, IA, a downtown segment of U.S. 18 with 12,000 ADT was converted from four to two lanes plus a center turn lane. A significant reduction in crashes was evident, and aggressive speeding went down by 52 percent.

**Public Acceptance**

Gaining public acceptance is important but can be challenging. Without the support of the residents and business owners, the road diet may not happen or, if it is installed, residents may criticize the transportation department’s efforts. Common concerns include impact on traffic flow, congestion, cost, increased traffic on neighborhood streets, and access to and from driveways and side streets.

A transportation agency can address concerns about traffic flow and congestion by providing the results of success stories where road diets improved mobility for all road users. When road diets are applied appropriately, traffic will remain relatively unchanged. Lagerwey offers a word of caution, however: “Pay attention to the signalization to avoid potential backups. See if you need to put in a left-turn arrow so your road diet doesn’t backfire.

The public reaction will be that there is a problem—not with the signal, but with the road diet—and they will want to get rid of it.”

Road diets are relatively low-cost improvements, especially if a repaving project is ongoing. In the case of reconstruction or repaving, most of the effort for a road diet improvement involves restriping only. In the larger picture, however, it is important to note that implementing a road diet can result in changing the roadway design to match the context of the desired land use. Land use and transportation need to be integrated. A road diet’s success can be dependent upon land use policies that support the desired transportation function.

Safety and economics are the major positives. As discussed earlier, research has shown that road diets potentially can result in significant reductions in total crashes, depending on the type of roadway and land use. As for economics, easier left turns into driveways and private parking lots can encourage more customers to stop for shopping, thus improving business.

Agencies can gain public acceptance for road diets by holding workshops like the one for College Park residents in Orlando. To measure and document the success of a project, before-and-after satisfaction surveys are crucial. In Orlando, the surveys indicated a high level of public satisfaction with the road diet improvement.

**Next Steps**

Nearly every community in the United States has opportunities to implement road diets. Highway agencies can use street and location criteria to identify potential candidates for road diets. In “Road Diets: Fixing the Big Roads,” Lagerwey and coauthor Dan Burden describe a number of additional case studies and suggest that candidate roadways meet some of the following criteria (see www.walkable .org/assets/downloads/roaddiets.pdf):

- Moderate volumes (8,000–15,000 ADT)
- Roads with safety issues
- Transit corridors
- Popular or essential bicycle routes and links
- Commercial reinvestment areas
- Economic enterprise zones
- Historic streets
- Scenic roads
- Entertainment districts
- Main streets

When deciding to implement this treatment, road managers, engineers, and planners need to consider whether the street meets any of these criteria and whether it is on a transportation improvement plan. Lagerwey offers a rule of thumb: If the prospective road is in an urbanized situation with a number of left turns, short blocks, and a signal at every corner, then a road diet could be appropriate in some situations with a traffic volume as high as 25,000. On the other hand, if a road has virtually no left turns and few signals, a road diet might be inappropriate if the ADT is over 18,000.

The steps for implementing road diets will vary from community to community. The process depends on who owns the road, plus the local and State regulations. Requirements probably will differ on the kind of study and analysis needed.

Road diets help to reclaim the street space for enhanced use rather than devoting them just to moving peak hour traffic. “When you start looking at total street capacity, the story we have to tell about road diets becomes even better,” says Lagerwey. “This is more than just something for bicyclists and pedestrians; this is energizing the street, it’s economic development, it’s a way we can reclaim and ‘re-peoplite’ our streets. The good news is this: literally every community in America has opportunities to do road diets.”

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