

# Carmel, Indiana Installs 100+ Roundabouts to Increase Community Resilience

## Project Summary

Since 1996, Carmel has converted more than 120 intersections to roundabouts. The projects were introduced by the Mayor, funded by several local, state, and federal sources, and implemented by multiple local government departments. The resulting network of roundabouts has saved Carmel money, reduced vehicular emissions, improved air quality, and enhanced community walkability and traffic safety.



Roundabout in Carmel, Indiana. Courtesy of City of Carmel, Indiana  
How did they do it?

### Action

Carmel identified a long-standing vulnerability and adaptation opportunity

- Carmel identified areas in the city that were in need of improved pedestrian conditions and traffic flows.
- City leadership researched roundabouts as a solution and piloted them in different parts of Carmel.

Carmel reduced current and future vulnerability

### Applicable Resources

Use tools to identify transportation and pedestrian vulnerability and create pathways for improvement.

- [Pedestrians First: Tools for a Walkable City](#)
- [Complete Streets Toolkit](#)

Learn about strategies that work for you

## How did they do it?

### Action

- Carmel replaced nearly all traffic stops in the city with roundabouts, completing more than 120 roundabouts over 20 years.
- By embracing an integrative project planning approach that created an efficient network of roundabouts, the city yields multiple benefits through less vulnerable traffic patterns, improved pedestrian conditions, and delivery of fuel savings and emission reductions.

### Applicable Resources

community and undertake transportation planning processes.

- [Roundabouts by the City of Carmel](#)

Carmel created a long-term plan and secured funding from various sources

- These projects were carefully planned through a multi-departmental collaboration and funded through various sources, including bond issues, highway safety funds and more.

Find funding that can support your community's infrastructure needs.

- [Congestion Mitigation and Air Quality \(CMAQ\) Improvement Program](#) funding

## Background

Carmel's roundabouts were initially championed by the Mayor, who had recently returned from traveling in Europe and was inspired by the walkable communities he visited. Determined to improve pedestrian conditions, traffic flow, and reduce tailpipe emissions, Carmel introduced its first roundabouts in a newly constructed corridor before moving to established intersections. Overall resilience has improved as more parts of the city increase accessibility to various forms of mobility, and traffic is no longer dependent on electric stoplights—this is crucial as the likelihood of power outages may increase as the climate changes. Now Carmel has more than 120 roundabouts, only about a dozen traffic signals, and is internationally known for their roundabout network.

## Implementation

Roundabout construction was considered to be one of the new Mayor's top ten projects in his first term. The first roundabouts were constructed in a newly constructed corridor before ultimately moving to another part of the City and implementing a series of existing traffic corridors that were undergoing improvements—the project manager highly recommended prioritizing intersections that were already scheduled for infrastructure upgrades. The engineering teams focused first on the East side of town, then moved west, and then prioritized intersections where there were existing four-way stops. Carmel observed that the roundabouts were so effective at moving traffic that parallel corridors began to function poorly, so it became a goal to ensure that all parts of the city were operating at the same level of efficiency so as to not create traffic hot spots.

Throughout the conversion of intersections to roundabouts, Carmel also makes sure to build streets that can accommodate all uses of bikes. While cyclists using roadways can take advantage of the roundabouts, the project manager emphasized that this only

targets about 10% of Carmel's population. The roundabout construction has allowed for more multi-use path construction which creates a safer, more appealing bike experience for a greater portion of cyclists. The next phase of planning for future and existing roundabouts is to identify how they can further support a denser urban core and shift to increased public transit use.

## Funding

Roundabout construction and maintenance are largely supported by local government funds that are allocated in City's yearly budget. Some projects have been completed through bigger capital improvement initiatives. For example, the Mayor works with the City Council to acquire funds through a bond issue. Roundabouts have also been funded by federal transportation funds through the Indianapolis Metropolitan Planning Organization, for which jurisdictions must compete for projects throughout the region. Other sources have included highway safety funds and Congestion Mitigation and Air Quality (CMAQ) Improvement Program funding. The project manager indicated that securing highway safety funds can be difficult as it is tied to a cost-benefit ratio; if jurisdictions are seeking to complete a roundabout reconstruction project with these funds, the existing intersection must be very unsafe to qualify (for example, a high rate of two way stop fatality).

## Timeframe

The first roundabout was constructed in 1996. Since then, more than 120 roundabouts have been constructed as funds became available.

## Outcomes and Conclusions

In 1996, Carmel had a population of 30,000 and experienced 217 traffic accidents. Now, in 2019 and 120+ roundabouts later, there are approximately 100,000 residents and there have been fewer than 200 traffic accidents. The improved traffic safety has translated to safer conditions for road cyclists and pedestrians. Over the last 20+ years, the city engineer's office has determined that roundabouts cost \$250,000 less than signalized intersections to build and save more than \$5,000 per intersection in electricity costs. Since traffic moves more efficiently with roundabouts, cities will be less likely to have to add lanes in the future—which can also generate monetary savings as Carmel's roundabouts cost between \$1.0-1.5M each on average and it can cost \$7-10M per mile for additional road lanes. Maintenance of the roundabouts is also much simpler and cheaper as there is no longer a need to maintain the signal, route electricity, install equipment, or provide labor to check on the signal. The roundabouts have also proven easier and more efficient to plow during snowstorms.

The City has also quantified fuel savings and developed systems of receiving feedback on travel time changes for the roundabouts implemented. Carmel has determined that due to the elimination of traffic jams and associated engine idling, each roundabout achieves approximately 24,000 gallons of gas per year in savings. With more than 120

roundabouts at an average of \$2.50 per gallon, this equates to more than \$7,200,000 in savings per year. Large climate change and local air quality emissions savings are also realized—transportation emissions are one of the largest sources of nitrogen dioxide, which is linked to airway inflammation and respiratory symptoms in asthmatics. Finally, roundabouts have allowed Carmel to shrink their overall transportation infrastructure footprint and not buy as much property—this ensures that less land is developed and fewer resources are utilized overall. Carmel’s efforts have acted as a model and proof to the state, which has recently begun to incorporate roundabouts in other areas in Indiana through the state highway department.

## Challenges

Too often traffic and pedestrian corridors are being designed for the worst-case scenario. When this hyper-conservative approach is adopted, cities often make corridors too big, which allows for higher speed. Using roundabouts, cities can create smaller, safer intersections with narrower lanes, which can also better support the introduction of landscaping, more permeable surfaces to help prevent flooding, and multi-use paths for pedestrians and cyclists.

To achieve these outcomes, cities want to ensure that roundabouts are prioritized and implemented in the highest need locations as well as in areas where the project will be successful. This can be challenging, so in order to make projects happen managers will want to get early buy-in from all levels of government involved.

## Recommendations

The project manager recommended that cities begin with the intersections experiencing the greatest safety problems or with a high traffic corridor. This will ensure that the safety, traffic, and cost benefits can be experienced in the areas with the most need and along the corridor where ripple effects can have big impacts. If roundabouts are implemented throughout an entire corridor, the average cost per accident will go down and traffic will decrease more quickly. Though if he had to do it all over again, the project manager said he would want to be more aware of the fact that roundabout construction has the possibility to invite more traffic inflow since the roundabouts function so well. Overall, the project manager stated that he does not see himself recommending a traffic signal anywhere in the city because the benefits of roundabouts are plentiful and proven. Sometimes adding capacity (i.e. lanes) can make sense, but with roundabouts and improved traffic conditions, the project manager encourages zooming out to consider the big picture mobility plan for the city and really thinking things through. Please see below for some walkable communities planning information and tools.

## Project Resources

- Find resources for creating a walkable city using [Pedestrians First: Tools for a Walkable City](#).

- Learn how to use a Complete Streets approach to planning with the [Complete Streets Toolkit](#).

For more information on Carmel's roundabouts, contact

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