

The background features a cityscape with various buildings, overlaid with a complex network of white and blue lines, circles, and hexagons, suggesting a digital or technological theme. The overall color palette is dominated by blues, purples, and oranges.

# AUTOMAT A

By Amalendu Chatterjee, PhD

**M**edia coverage indicates that North Carolina has taken a new role of technology and innovation to attract new businesses, and many companies have responded to this new initiative. Research Triangle Park (RTP), in particular, is noteworthy.

RTP is one of two strategic regions (the other is Charlotte-Mecklenburg) in the heart of the state capital of North Carolina. RTP encompasses four major cities—Raleigh, Cary, Durham, and Chapel Hill—is home to an international airport, and features many major universities, renowned hospitals, shopping malls, and headquarters of many high-tech companies. This region has also seen a tremendous growth in population, with a current population of more than 1 million that may double in the next decades.

In the coming years, North Carolina may see 31 percent growth, but 91 percent of that growth will settle in two recognized regions and other major cities; some of those cities have been declared as the best cities in which to live. The rate of such urban growth is almost equivalent to big cities such as New York City from an economic development point of view. Because of such importance, the North Carolina Department of Transportation (NCDOT) has taken a strong position toward improving the transportation systems of these regions to be competitive to attract large companies.

With that in mind, NCDOT developed a strategy, 2040 Transportation Plan: Challenges and Opportunities prepared by ATKINS (a consultant) in September 2011. In addition, there is also a website, [ncvisionzero.org](http://ncvisionzero.org), to track fatalities among different DOT agencies (law enforcement, emergency responders, drivers, and engineers in charge of collecting data).

All of these activities drew my attention to make RTP a test case for studies on how to incorporate modern technologies such as autonomous vehicles, internet of things, automating the process with the help of artificial intelligence, hyperloop, etc. Hopefully, ideas expressed in this article will add value to the NCDOT 2040 transportation plan when it is updated based on frequent public comments.

# ING CITY

CASE  
STUDY

*Proposing a new, automated transportation system in North Carolina.*



## References

The objective is to raise awareness beyond just a local issue to a state one, expressed in several recent articles that have addressed the future needs of transportation:

- “Transportation Needs are Vital,” *News & Observer* editorial board, August 25, 2017.
- “Gov. Cuomo’s Wise Move on Congestion Pricing,” *New York Times* editorial board, August 20, 2017.
- “Open-Road Tolls Could Pave the Way for Manhattan Congestion Pricing,” Marc Santora, *New York Times*, August 25, 2017.
- “Virgin Invest in Hyperloop One, With Eye on 670 M.P.H. Commutes,” Jacey Fortin, *New York Times*, October 12, 2017

The first editorial discusses the use of a \$206.7 million transportation bond voted in by Raleigh, N.C., citizens. It raises the issue of a large population increase that has given rise to the need for modernization of our crumbling infrastructure, but it does not address the city-specific problems of parking, ride-sharing, traffic, or transportation-related services.

The second editorial supports New York Gov. Andrew Cuomo’s move of congestion pricing strategy on certain types of traffic—a recycled idea (borrowed from an old Move N.Y. plan) with many highlighted advantages. For example, congestion pricing may be the fairest pricing scheme for heavy users of the infrastructure system, raising funds for transit improvements and reducing traffic.

The third article calls attention to the technology revolution with automated toll collections—No Stop & Go. It suggests that technology has arguably advanced faster than we can take advantage of for our complex urban and associated suburban areas. Finally, the fourth article discusses the high-speed commutes between adjacent cities initiated by Elon Musk’s Hyperloop One. Hyperloop Transportation Technology (HTT) is the brain child of Musk, who has opened up the development platform for anybody to participate and enhance different components. Musk is working with SpaceX for a Hyperloop One trial between Los Angeles, Calif., and San Francisco, Calif., to achieve a transportation time of 35 minutes with an average

speed of 600 miles per hour. This idea of reducing the transportation time to almost less than half from the current time required by train or plane caught attention nationally and internationally.

Technology improvements and trials are being planned all over the world. There may be also some competing technologies beside the capsule/pod we’ve read about in the past. The Massachusetts Institute of Technology is working on similar projects/trials as well. There is a detailed write-up on the subject on Wikipedia. I am proposing that a similar trial for RTP may be ripe to support NCDOT’s efforts for a business promotion in the area.

## Unified Strategy

All the articles above raised important issues without providing a unified strategy or a vision for regional transportation services. Major elements of the vision might address:

- Powerful automation of transportation services technology.
- The integration of urban and suburban areas.
- Implementation of renewable energy.
- The possible adoption of Vision Zero—an internationally accepted plan for the intelligent transportation system (ITS).

The objective is to have an intelligent and integrated transportation system around the greater RTP that will include at least Raleigh, Cary, Durham, and Chapel Hill. It should also address transport from all areas to airports, railways, and bus stations. With the Hyperloop One concept, the RTP plan could be extended to adjacent cities such as Greensboro, Asheville, Wilmington, Fayetteville, and Charlotte.

## Technology Automation

NCDOT is under tremendous pressure to improve RTP’s transportation services, as well as the transportation from and to other state business centers. High-speed rails have been identified as a possible approach, but no concrete plan has been approved or is underway yet. Newer vehicles have already automated self-driving and parking. Ride-sharing (Uber and Lyft)



is automating the last mile of commuting. I-540 toll collections (surrounding RTP) via high-speed cameras have been automated by transponders (RFID tag or no tag) and high-speed cameras with No Stop & Go at more than 99.99 percent accuracy in RTP. Collection rates for such automated toll services are also high.

Similarly, parking in a garage or a metered or non-metered space can be automated by a geopositioning system (GPS) irrespective of any meter or barrier. GPS integrated with bluetooth low-emission beacons can correlate vehicles to enable parking locations for autonomous parking charges. Truck parking in the interstate highway corridors and entry to cities can also be automated to lessen the traffic during commuting hours. Weighing stations and truck parking can also be correlated for automation with internet connectivity. Drones, like No Stop & Go, in automating toll services, can automate traffic monitoring and ticketing for traffic violations. Digital maps can automate alternate route selections to avoid congestion due to accidents or other reasons. Such automated services, in most cases, avoid face-to-face confrontation, altercation, fist fights, or cash handling without any manual handling.

It is a question of connecting all the dots for auto identification and auto invoicing. It requires private and public cooperation at all levels of governments—updated policies and regulations with a clear vision to connect each technological dot in isolation or combination. It will enhance suburban economic development plans starting with suburban truck parking subdivisions (STPS) close to the periphery of the city, at a point before they enter the city for delivery and pickup activities (last mile). Even autonomous vehicles can ease the congestion to carry goods without heavy trucks entering the city.

### Urban/Suburban Interconnectivity

In RTP, four cities are interlinked for education, business, transportation, and social activities. The populations of these cities and the surrounding areas are growing at faster rates than ever. Every city has been trying to solve its own transportation problems. But solving the transportation problem city by city will create a bottleneck when transportation needs among these cities grow more than eight or 10 times, according to a North Carolina demographic survey. We need a vision to automate and interconnect these cities effectively with mobile devices and automated vehicles.

Fifty years from now, these four cities together could achieve traffic flow at similar levels to many big cities

today. That is why automated and integrated public transportation and parking in these cities is so important. We are fortunate to have the opportunity to plan ahead and avoid the pitfalls. One new idea is to remove all parking facilities from the city business center to the city's periphery. One can call it a suburban parking district (SPD). Transportation to and from these two points of interests will be fully automated by frequent transportation services by subway or driverless vehicles.

Both SPD and STPS implementations could move city congestion away from the center of town to the edge of the city. Motivations are to drive less in the city and take advantage of virtual transportation services. In the future, fully automated vehicles will transport both people and goods from these districts to the city business centers without trucks or big buses entering the city, reducing congestion and pollution.

### Renewable Energy

Lockheed Martin has taken a pioneering step to cover several hundred parking spaces with a solar plan in one of its Florida facilities. The result is the availability of significant electricity to power their facilities from parking lots. The project saves the company 30 percent of electrical costs with the additional benefit of reduced pollution. STPDs and SPDs will be the source of renewable energy to supply all power needs of the completely and newly defined consolidated and integrated ITS and its automation. STPDs and SPDs can act as energy hubs for new economic development also.

### Vision Zero Implementation

Vision Zero is an achievable target goal of the future transportation system such as ITS. The idea that life and health can never be exchanged for other benefits within the society was conceived in the Swedish Parliament and accepted worldwide as an exceptional road safety plan.

In conclusion, as the rest of the infrastructure in the Triangle modernizes, we need a comprehensive, innovative plan to automate transportation and parking services. Many innovative trial projects can be initiated to explore their high potentials. 



**AMALENDU CHATTERJEE**, PhD, is vice president, technology, with Eximsoft. He can be reached at [amalendu.chatterjee@eximsoftint.com](mailto:amalendu.chatterjee@eximsoftint.com).