Can't Get There from Here—Or Can We?

Unfortunately, traffic planning, which is little more than applied common sense, is not getting us where we want to go.

BY WALTER M. KULASH

Traffic planning is admirably simple. It forecasts the demand for travel for a period of 15 to 20 years, checks this forecast against the available road capacity, and then plans more or wider roads that provide the needed capacity.

This commonsense approach is backed up by some good science. Forecasts of future travel demand are based on future population and related activity, such as employment. The data for these projections come not from traffic planners but straight from unimpeachable sources such as statewide forecasts, often the single official source for all planning. These data are generally reliable.

The model used for forecasting travel demand—widely known as the "traffic model"—is likewise unimpeachable. This model follows the commonsense premise that the amount of travel between origin and destination zones varies directly with the quantities of the origins and destinations in the zones and inversely with the travel time between them. The logic of this formula, which resembles the physics formula for gravity, is hard to fault and in fact has not been faulted, as evidenced by the use of the model throughout the United States.

Initially, the model creates a to/from table of all trips in the region; then an ultra-sophisticated "trip assignment" channels these trips onto the road system, simulating drivers' choices. The trip assignment recognizes congestion as it appears and reroutes traffic away from congested routes accordingly. This sophisticated process is made possible only through hefty computer power.

Everything about this process, then, argues for good realism and accuracy: it begins with solid demographic data, it employs unassailable logic in matching origins and destinations, and it relies on an ultra-sophisticated simulation of drivers' routes themselves. This should be a sure-fire tool for solving our traffic problems.

Unfortunately, it isn't. More likely, our transportation planning process makes our traffic problems worse. Rather than reducing congestion, the traffic model adds to it. Rather than adding to the quality of life, the model diminishes it.

What Went Wrong?

With all that it has going for it, why does the process fail? By not recognizing the single greatest impact of new road capacity—that new capacity itself raises the demand for travel. This induced travel appears in myriad ways. Road expansion—say, a new segment of freeway—puts a new supply of home sites within a comfortable driving time from school and work for many homeowners.

Consequently, in response to the improved travel time, some homeowners in the developed part of the city will choose to disinvest in their current home and move to a tract home in the new subdivision served by the road expansion. Usually, the daily vehicle miles of travel generated by the moved household increase greatly as a result of a longer trip to work, more cars for the family, and more and longer trips to dispersed shopping and other destinations.

Neither this residential relocation nor the large amount of additional vehicle miles of travel resulting from it are captured in our travel demand forecasting process. To the contrary, our process assumes that the only result of the road expansion is that traffic moves faster. Indeed, moving faster is a short-lived first impact of the road extension and quickly gives way to moving farther, not faster or with greater efficiency.

Travel destinations also change rapidly in response to new road capacity. "Big-box" retailers, like Wal-Mart and Home Depot, will build even larger boxes, such as 200,000-square-foot superstores, in response to increases in road capacity. More road capacity delivers more potential consumers to a single store within a 10-to-15-minute travel radius. Thus, the traffic planning favors the consolidation of retailing for these types of businesses into fewer larger stores rather than earlier patterns of smaller, more numerous scattered stores.

Always, consolidation leads to more travel. Again, our travel-demand forecasting process does not account for this increase in induced travel. Rather, it assumes that travel destinations—retail patterns, for instance—remain perfectly unchanged, despite changes made to the road.

So we have a reassuringly simple process that unfortunately does not recognize a central feature of what is being planned. While some holdouts—the Federal Highway Administration, for one—are still protesting that induced traffic does not exist, researchers are establishing its real magnitude. Leaders in this research at the University of California at Berkeley find that induced traffic consumes about 90 percent of new road capacity within five years of its opening.

The Unstoppable Loop

Although induced traffic is still a surprise to our transportation planning field, the idea is hardly new. Feedback loops, in which a small input triggers a vast spiral of reaction, were an early and pivotal discovery in systems analysis. Positive—productive—feedback is at the heart of much electronics design. Negative feedback—unintended consequences that are harmful, for instance—in public activities has long been understood. Almost 30 years ago, the widely discussed *Unheavenly Cities,* by Edward Banfield, showed that negative feedback occurs in many public services, including the provision of roads. Similar themes were recently presented in Edward Tenner's 1996 book, *Why Things Bite Back: Technology and the Revenge of Unintended Consequences*.

Negative feedback is even at the heart of tongue-in-cheek theorizing in Parkinson's Law. The Parkinson's Law thesis—that activity expands to fill the time allocated to it—is analogous to the thesis that traffic will fill the space allocated to it.

What eventually happens to a process with built-in feedback? The answer is quite simple actually. The process just keeps looping back through itself until something brings it to a halt. With traffic, the process is familiar. New road capacity, only a few years old and planned to be sufficient for 15 or 20 years, is already congested within two or three years. The public complains. Editorialists deplore it. Political candidates out-promise each other to "fix the road mess." Traffic copter reports confirm daily that, yes, the roads are congested again.

So what do we do about it? We update our standard transportation planning process to account for these still-surprising jumps in traffic. We map the induced growth that—surprise!—occurred as a result of the last round of planning and now properly reflects it in the model. Of course, we still know nothing about the next wave of induced growth. Remember, the process is not capable of dealing with this until after it happens.

With the update in the regional plan comes a new round of road "needs" to serve the now-recognized growth. Then follows a "financially feasible" plan for capacity expansion, which essentially evaluates what we get by spending all the available money. These go into a routine known as the Transportation Improvement Program for the design, property acquisition, and construction phases, putting new capacity on the street in three to six years.

And then the process starts all over again: another round of road widenings and extensions, another wave of induced traffic, another round of hand wringing, possibly followed by an even more ambitious attack on the "traffic problem."

All Good Things Must End

Not surprisingly, this chain of events cannot continue forever. The process comes to a halt, either intentionally or through default, for a variety of reasons:

■ **Sheer exhaustion**. Most of the time, the traffic planning cycle crashes simply because nobody knows what to do about it anymore. The next round of new capacity is simply too strenuous financially or politically or there's no more room for an expanded right-of-way. A consensus builds that we can't do anything about a particular problem, and for lack of any other alternative, we simply leave it alone. The problem isn't resolved. Attention simply gets redirected to other

corridors or other solutions.

■ **Ludicrous designs**. Often the next step in the cycle calls for road designs that fail the "straight face" test of what's reasonable. Ten-lane roads, 14-lane approaches to intersections, four-minute traffic signal cycles, and triple left-turn lanes, are some of the signs that we've gone too far. While they may be recommended by lower-level technicians, these things are not likely to survive the reality testing applied at the level of the departmental head or elected official. The cycle, therefore, stalls on the grounds of silliness.

■ **Running out of money**. Lack of money frequently breaks the cycle. Often, the "financially feasible plan" has become a euphemism for the recognition that we can't afford to fix the problem and have to content ourselves with what we can afford. By definition, "financially feasible" projects fall short of the needed new capacity being called for by the process. The "financially feasible" plan, therefore, is a somewhat planned way of halting the cycle.

■ **Direct throttling**. In a few communities throughout the United States, local policy has vigorously intervened in the process, bringing it to a halt at a road size the community wants, which frequently is just two lanes. Because of their qualities, many of these communities are household names—Winter Park and Coral Gables, Florida; Santa Fe, New Mexico; Monterey, California; Grosse Pointe, Michigan; Shaker Heights, Ohio. These communities all have a common approach to transportation planning. They size roads to express what they want their communities to be; they deliberately do not size roads to fit a traffic projection.

■ **Insurrection**. In many communities—probably hundreds—throughout the United States, the conventional transportation-planning cycle, either on a regionwide basis or for specific roads, is being broken by that most-American of approaches: taking things into your own hands. In these places, stakeholders have simply concluded that enough is enough.

These stakeholders cover a wide spectrum: homeowners, environmentalists, main-street business owners, chambers of commerce, tourism industries, historical societies, city governments, homeowner associations, foundations, highway-oriented business coalitions, and institutions. And while the parties to these actions are diverse, the agenda is always the same—to terminate the otherwise seemingly endless cycle of capacity additions, induced traffic, and yet another round of capacity additions.

A sampling of the myriad of ways in which these initiatives find their final expression include comprehensive plans that limit road size (Winter Park, Florida), city council resolutions requesting the deletion of projects (Campbellton Road in Atlanta), broad-based real-estate development coalitions demanding the downsizing of freeway-like intrusive roads (RiverValley Partners in Chattanooga, Tennessee), litigation on environmental grounds by public interest groups (Southern Environmental Law Center versus the Charlottesville, Virginia, bypass), and litigation by a city (South Pasadena versus the state of California, challenging completion of the 710 Freeway).

The amount of such activity and the broad spectrum of partisans involved suggest a large and possibly growing level of distrust of the conventional transportation planning process. Could it be that the public is out in front of the specialized traffic planners?

Conventional Thinking

In fairness, it should be recognized that planning for traffic is more complex than for most other publicly provided services. Other services do not have the induced demand that traffic has. For example, increasing school capacity, with more floor space or more teachers, does not increase public demand for education. We don't increase our children's primary education from 12 years to 13, 14, or 15 simply because our school district adds capacity.

The same is true with wastewater treatment. New wastewater treatment capacity does not encourage us to go to the bathroom more often. So transportation, with its large induced demand, differs fundamentally from the typical public service. It is understandable that we might borrow as an appropriate model for transportation the straightforward planning process—forecast needs, then fill them—that serves other public services so well. Unfortunately, such models are not appropriate for traffic, and patterning traffic planning on them ignores the defining challenge—induced demand—of transportation planning.

The futility of the current traffic planning spiral typically is hidden by the juggernaut that benefits from the spiral. Current traffic planning gives powerful support to the thriving business of decanting cities of their most desirable residents and businesses and moving them to ever-more-distant suburban and fringe areas. The process promises to serve the travel demand created by these movements. It even promises high "levels of service" for traffic, pledging to all parties to this decanting—the developers building the new growth and the consumers filling it—that state and local governments will support that pattern.

Not only do the most-direct beneficiaries—builders and developers—of the cycle share the bounty; a small army of others also benefits, including the road-planning and road-building industries, gas stations, and auto-service centers, which benefit from more vehicle miles of travel.

Indeed, even the business of deploring traffic congestion has a clear interest in perpetuating the congestion. The radio traffic copter reporter, the newspaper traffic reporter, and the gripe-column editor would be out of business if congestion were ever solved. To the beneficiaries of the traffic planning process—primarily, the providers and consumers of new growth—the process is not flawed at all. Rather, the process is an ingenious perpetual-motion machine delivering unending benefits.

Even common sense seems to favor the existing process. If the need for a service exceeds its availability, what could make more sense than to create more capacity, thereby filling the need? This simple common-sense answer would be correct if the need stayed filled. With traffic, however, filling the need simply creates more need, and the common-sense answer evolves into the out-of-control spiral we now call traffic planning.

In past decades, traffic capacity improvements were more durable, providing relief from congestion for a longer time than at present. Prior to the 1960s, street widenings were complemented by large existing networks of supporting streets already in place. These supporting networks magnified the usefulness of the new road capacity. Also, early rounds of capacity increases did not trigger the levels of induced traffic that we see today. Retail did not follow immediately, since shopping centers were relatively slow in coming; big-box retail stores designed to exploit mobility were not yet invented; and jobs remained in place, not in new office parks.

Public opinion, likely to still believe in this earlier quality of durability, has a now-faulty, overly optimistic view of the longevity of new capacity. In fact, the durability of new capacity has eroded drastically. Most new road capacity is now added in suburban areas where no new supporting road network is being added. The sparse mileage of existing local roads—typically, county rural highways—is pressed into service as the only connected street network. New development patterns, commercial as well as residential, are masterpieces of avoiding the construction of any useful connected road network. To the contrary, they load all their traffic on the sparse mileage of existing roads.

There may also be a feeling that new roads, being larger and modern in design, are somehow more efficient—that is, they will carry more vehicles per lane of traffic, thereby accelerating traffic relief. This belief is understandable but incorrect. Most other producers of public service do indeed get more efficient with larger, updated facilities. Modern wastewater treatment plants are more efficient than older ones, for example; and for plants of any comparable age, larger plants are far more efficient than smaller ones. The same is true for electric power generation, or at least it was before the advent of small, modular electricity generators such as fuel cells and microturbines, which are located on the customer's premises.

The same can't be said for roads, however. The saturation volume of a road—its ultimate capacity—has changed almost negligibly for city streets over the past 60 years. The first edition of *The Traffic Engineering Handbook*, which came out in 1941, established an hourly capacity of 1,500 vehicles per lane of traffic under stop-and-go flow conditions. The year 2000 update of the *Highway Capacity Manual*, the current bible of highway capacity, recommends that, for planning purposes, an hourly volume of around 1,500 vehicles should be considered as "approaching capacity."

Traffic on freeways and roads without traffic signals, however, appears to be gaining ever so slightly in capacity, no doubt a reflection of radial tires, power-assisted disc brakes, street lighting, and so forth. For free-flowing conditions, the 1941 *Traffic Engineering Handbook* establishes a capacity, of 1,900 vehicles hourly. The 2000 *Highway Capacity Manual* gives a comparable value of around 2,000, or a 5-percent growth over 60 years—not exactly a major advance.

If We Don't Build It

So what happens, either by design or default, if we end the spiral of more roads/more traffic/ever-more roads? Do we finally get gridlock, which, like the mythical dragon, is dreaded but seldom seen? Do entire city councils get turned out of office and replaced by pro-road candidates? Does business strangle, as our economic development staff warns us, while the economy withers? Even more awful, do jobs get lost?

No, none of these things happen. Rather than apocalypse, we get a series of gradual adjustments, far more beneficial than damaging.

An important part of the answer to where the traffic goes is that there is not nearly as much of it needing to go anywhere as we thought. Roads, like power plant capacity

and wastewater treatment capacity, are sized to carry the peak surge in demand. Removing some of the capacity, or, equivalently, opting not to build some further capacity, affects only this peak surge. During the rest of the day, all other demand is comfortably within the reduced capacity of the road.

So deciding not to build two additional lanes does not mean that 20,000 vehicles daily—the reasonable rule of thumb of the capacity of two lanes—will have to find some other accommodation. Rather, it means that scarcely 5 percent of that number, or about 1,000 vehicles during the critical peak hours, will have to find some other accommodation.

And the accommodation that drivers find, when free-flowing road capacity is not available, is nothing at all like the apocalyptic gridlock that transportation planners are fond of predicting. Drivers are smarter than this.

An early adjustment that drivers make to peak-hour congestion is simply to move their travel away from the most congested times. For a large and growing number of workers, shifting times is increasingly acceptable. Information-industry work schedules—as opposed to factory work-shift schedules—answering machines, pagers, and cell phones all enable flexible working hours. To the traffic engineer, shifting a vehicle trip away from the peak period is better than adding the same amount of new capacity, since the existing road is being more fully used, at little additional cost.

As congestion builds on the existing routes, drivers are quick to reroute themselves. Rather than simply dumping themselves onto the nearest available alternate, as the doomsday view of traffic congestion warns, drivers actually reroute themselves in an elaborate cascade of route changes. Granted, many drivers shifting from their primary route simply divert to the nearest available alternate route. But drivers already on the alternate route do not simply ignore the new traffic and meekly sit in line, waiting for gridlock. Some drivers on the alternate routes—those at the margin of choice between routes—move instead to yet another alternate, and so on, through an elaborate chain of reroutings. The trip-routing procedures in the traffic model do a great job of tracing these impacts through the millions of daily decisions that drivers in a region make.

The same traffic models that tell us we need more road capacity to maintain free-flowing traffic tell us, on the other hand, that if we don't build that capacity, the system will continue to function quite nicely. Why should this be a surprise? If we build it they will come; we know that. Isn't it equally likely that if we don't build it they won't come? That is exactly what happens. The whole question is one more facet of the endlessly intriguing riddle of induced traffic.

Crisis with No Victims

Perhaps the most interesting places that traffic goes, because of congestion, is to different patterns of origins and destinations. The home, which is the origin of most trips, is one of the most volatile in this respect. As major new road capacity is added—a suburban freeway, for example—some homeowners currently living in the older parts of the city and reinvesting in their neighborhoods will choose to move their household to a new suburban tract home, inevitably spawned by the road addition. Conversely, if the new road were not built, the same household would remain in place, continuing to reinvest in an existing neighborhood.

How dire then is this important impact of not building new capacity? Who is victimized by the decision not to build the new road? It's difficult to find a victim of traffic congestion. Certainly not the community where the homeowner lives now. This community has a deep interest in its homeowners staying in place and reinvesting. Certainly not regional school districts, which are not interested in adding capacity in one place while abandoning corresponding amounts of capacity somewhere else. Perhaps the suburban tract-home developer might be one stakeholder who loses. But doesn't this homebuilder, with a shift in product and location, have every opportunity to develop in the existing settled areas, where values are increasing due to location?

Trip destinations also react to congestion. Free-flowing traffic is a promise to the retail industry that large catchment areas of population will be delivered to a single location, at the kinds of travel time—typically 15 to 20 minutes—needed for big-box retailing. The result: ever-larger big-boxes, with a corresponding ever-increasing amount of travel required for the same amount of purchase. Endlessly expanding the scale of big-box retailing is contrary to every planning objective on the books anywhere. Yet, at the same time, the typical good-roads policy of maintaining free-flowing traffic at all times presents an irresistible incentive to further concentrate retailing in very large boxes.

What happens when the promise of free-flowing traffic is withdrawn? Does the retail industry abandon the area as infeasible to service? Of course not. The industry is far smarter than that. Grocery

chains will run neighborhood-sized stores of 40,000-50,000 square feet at more locations, rather than fewer big-box stores of 130,000-200,000 square feet. Franchise retailers will reduce territorial requirements, yielding more locations with smaller market areas and less travel time. Retailers, formerly operating only in single-owner, closed-environment malls, will expand into multi-owner open environments such as main streets, downtowns, and neighborhood centers.

Technology appears to favor the pattern of more, smaller, commercial destinations rather than fewer large ones. Automated warehousing, inventory systems that automatically replenish even small sales, self-service checkout, and electronic theft-prevention hardware enable retailers to operate at more numerous, smaller locations rather than fewer large ones.

Again, it is difficult to find any victim of these reactions by retailers to increased traffic congestion. Retail customers, with more and closer shopping destinations, are certainly not victimized. Nor is the development industry, building more units and more floor area. Nor are local communities, many of which are seeing long-neglected main streets being reoccupied by retail businesses. Nor are the retailers themselves, who are mastering, even if reluctantly, more-sustainable ways to retail.

Traffic, it is becoming clear, is loaded with examples of unintended consequences, in both directions. The intended consequence of new capacity, to reduce cost and reduce delay, soon gives way to the unintended consequences of drivers going farther, not faster, soon followed by the moving around of households, businesses, and all the other daily destinations. None of the ultimate results—more travel, more congestion, sprawl—were intended.

The unintended consequences of traffic congestion, it has become clear, also run in a positive direction. The presumed dire consequences of not building new capacity—more travel time and cost—prompt a chain of events that is anything but dire. Homeowners reinvest in communities, and businesses find new ways to better serve their customers. That unintended consequences operate in a negative manner has always been well understood and yet always seems to fly in the face of conventional wisdom. It is not surprising that unintended consequences in a positive direction are just as likely and equally in conflict with conventional wisdom.

Abandoning Adolescence

Perhaps we are entering some sort of adolescence in outgrowing the auto-centric view of the universe and beginning to understand that moving more vehicles as fast as possible is but one, and not the most important, of many concerns in building great and valuable places. Perhaps we are like astronomers in the 15th century, when Galileo, understanding that the sun and not the Earth was the center of our solar system, greatly simplified explanations of what was going on. Perhaps we are learning from the vanished Cold War and the never-there Y2K crisis that we can organize our entire lives around dire predicted consequences that never come to pass.

The idea that we should get beyond moving traffic as our primary mission and get on to things that matter more is certainly not new. Humorist Will Rogers, an astute observer of the American scene, put it nicely in 1942: "America devised many odd inventions for getting somewhere, but could think of nothing to do when it got there."

The answer is not newer, or even odder, inventions for getting somewhere. The answer is to turn attention to having something there when we arrive.■

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