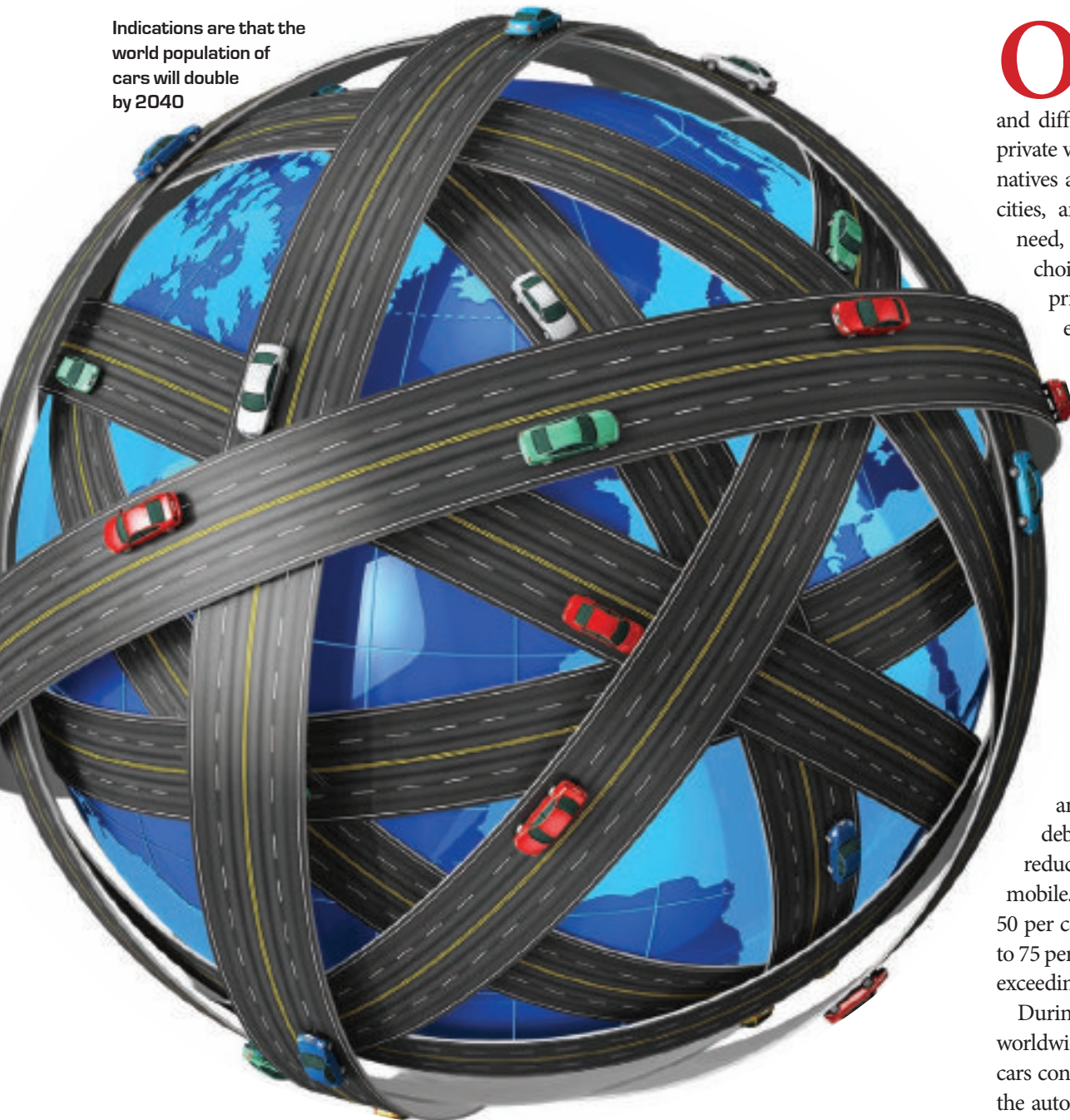


Social evolution and road pricing

The social evolution of automobility opposes the network and economic optimization logic we use to promote road pricing. We need a new approach to switching to mileage-based user fees, says Bern Grush

Indications are that the world population of cars will double by 2040



Our propensity for automobility is based in human evolution. This preference is powerful, genetic and difficult to mitigate. Reduced use of private vehicles and increased use of alternatives are arguably what our planet, our cities, and our transportation networks need, but too much of the systems and choice logic offered to promote road pricing runs counter to human evolutionary history and development. Many of the explanations for mileage-based user fees (MBUF) to replace fuel taxes include assertions that some of us will — or at least should — turn to transit, carpooling, cycling, and walking. For a significant portion of us, this threatens visceral and fundamental human tendencies—especially in those that have, or harbour a desire for, an automobile. Automobility is in our genes.

The past two decades have seen an increasingly anxious and diverse debate about managing, usually reducing, our dependence on the automobile. Worldwide urbanization passed 50 per cent in 2008 and is well on its way to 75 per cent by 2050, with the US already exceeding 80 per cent.

During this time the number of families worldwide that can afford personal motorcars continues to grow and preference for the automobile over other modalities will

“Should we pay road user fees via fuel duties or via a mileage-based user fee? Should road-use fees be used to fund public transit or other alternatives? Will they be equitable? Will privacy be protected?”



The Dutch government is investing more in road building than it is in public transport – should road-use fees be used to fund public transit?

remain strong. According to a recent news item, the Dutch Government, who in 2009 cancelled a world-leading promise to bring nationwide road pricing to all its roads and vehicles, is to invest US\$3.74 billion in road building versus US\$2.3 billion on public transport, including rail, in 2014. Credible predictions indicate that the world population of cars will double in the next 25 years¹ in spite of the indications of vehicle miles travelled (VMT) peaks in number of developed countries, including in the US.

These factors conspire to cram more vehicles into less space, increase congestion, demand more complex support infrastructure, and contribute to global warming. This fuels debate over sprawl versus densification, walkable communities versus suburbs, transit versus automobile, combustion engines versus electric motors, the “war on cars”, and many related issues. There is a thriving industry of conferences and projects under rubrics such as “smart cities”, “intelligent transportation”, “connected

vehicles”, “smart growth”, “autonomous vehicles”, and so on. Most of these look at ways to reduce or mitigate our use of the automobile.

ROAD PRICING

One debate in this panoply regards road pricing. Should we pay road user fees via fuel duties or via a mileage-based user fee? At one extreme, this is simply a switch to measuring the consumption of miles instead of gallons. At another, this can mean a complex demand management approach with distance-based charges weighted by time of day, place of travel, or type of vehicle. Should road-use fees be used to fund public transit or other alternatives? Will they be equitable? Will privacy be protected?

Road-pricing proposals may seem minor compared to many other schemes we consider for organizing ourselves in cities and managing mobility throughout conurbations, but it represents a microcosm of the cluster of debates related to

urban liveability and regional planning. The litany of arguments for the network, economic and social value of road pricing contrasts sharply with the history of low social acceptance for the idea. RAND Corporation’s Paul Sorensen describes current support for mileage-based fees as “dismal”². Only the acrimony surrounding the urban sprawl debate comes close.

Most readers will have heard dozens of arguments for and against distance-based road pricing: the tragedy of the commons, automobile overuse, privacy, equitability, over-taxation, infrastructure funding requirements, global warming, the evils of sprawl, lack of transit, liveability, alternative modalities, American reliance on “foreign oil” and the concomitant accusation that arms are used to defend entitlement to vehicle miles in amply endowed vehicles. There are arguments that money from road pricing should be used for public transportation, and by contrast, that it should only be used to build and maintain roadways. We hear promises that road pricing would rescue the automobile from the maw of congestion while simultaneously discouraging our dependence on the automobile. We hear concurrent arguments that we should simply raise the fuel tax, that the fuel tax is unsustainable, and that in any case there is no political appetite for raising fuel taxes.

These arguments populate academic journals, trade magazines, university textbooks, blogs and newspapers. They are heard on radio, and seen on television and YouTube. The rhetorical skill of those making these arguments ranges from that of Nobel laureates to on-line newsreaders with anti-tax sentiments or anti-government fixations. Taken together this is a desperate, confusing, and rancorous commotion.

SLOW PROGRESS

To date, this effort has been reflected in a few examples of complex and expensive road pricing systems, only a couple of which have abated fuel taxes. Notably, the latter have been for heavy goods vehicles in a few European countries. Others, greeted with more press excite-

ment and venom, were deployed for daily commuters in London, Singapore, and Stockholm. However, outweighing these relatively small-scale successes is the huge footprint of articles, conferences, debates, presentations, speeches, books, PhD theses, road-trials, etc.—i.e., all of the labour and high-carbon travel supporting these. How would the CO₂ expended to ferry road-pricing proponents to conferences compare to that avoided by the London or Stockholm systems? How much was spent by the Dutch Government and all its observers and respondents from 2006-2009 to accomplish, more or less, nothing?

By several accounts one of the key motivators offered for the much-delayed Galileo global navigation system has been intelligent transportation systems notably including road pricing. The world's investment in road user charging to-date has been considerable, but too much of it is in the form of debate, fear, acrimony and effort and too little of it in the form of working solutions so the payoff has been paltry. Sorensen identifies high-cost and low public support as the culprits.

HOLDING OUT FOR A HERO

There have, however, been heroic efforts behind these few successful installations. They have taught valuable lessons and largely operate as promised. Unfortunately, while the motoring populations that experience these systems generally respond favourably after operational teething abates, their important lessons are seldom applied to other jurisdictions. In the face of the entire problem of automotive infrastructure, congestion, global warming, and urban liveability, these few systems have not come close to addressing the full issue or paying back our investment in trying to solve the global problem. For the majority of motorists these solution instances



Mixed messages: Oregon Representative Cliff Bentz appeared to contradict his own stance on his state's proposed per-mile road use charge

go unnoticed, and for those drivers that become aware, the majority response remains: “not for me, thanks”.

If our reasons and arguments are so correct, sensible and optimal, why are they so often and for so long unaccepted?

CHANGING DEBATE

Unlike the high degree of agreement among climate scientists regarding global warming, we who argue for road pricing are less coherent. If we are not agreed, it is no wonder we provide a field day for journalists to pen weak and partial arguments that lead nearly every driver-pundit to criticize and every politician to delay action.

In the summer of 2013, Oregon Representative Cliff Bentz, Vice-Chair of the Oregon House of Representative's Committee on Transportation and Economic Development wrote an open letter to his constituents³ in which he explained:

“I opposed HB 2453 which would have imposed a [MBUF] of about 1.5 cents/mile — but only on cars that get more than 55 miles per gallon. This 1.5 cents/mile tax would have replaced the gas tax and, because few cars get over 55 miles per gallon, would have primarily applied to electric and hybrid cars. I opposed this bill because I know for certain that many tax payers in my District don't think that the complexities of the “per mile tax” have been completely sorted out.”

Bentz went on to explain that the current per-gallon gas tax regime was unfair to users of less fuel-efficient vehicles: “Given the fact that small cars use and wear out our roads just as much as do three-quarter ton pickups, the difference in what their drivers pay is unfair in a “user pays” system.” And he went further to explain that money is desperately needed, the current system will only become increasingly unfair to low-mileage vehicle users, and that a MBUF should be explored. This logic, which many of us would agree with, appears to contradict his regressive rejection of HB 2453 (however, he did vote for SB 810, Oregon's 5,000-vehicle voluntary MBUF pilot).

No single participant in these funding debates lacks certainly or commitment, but taken together we can be equivocal. In October 2013, former Secretary of Transportation Ray LaHood called for a 10-cent increase in, and the indexing of, the gas tax⁴. For the past decade, many of us have argued that it was too late for this and that only a demand-based MBUF would address both funding and congestion.

Of course, the matter of choosing a funding mechanism hinges on “sustainability”. Indexing is certainly more sustainable than the current fixed per-volume calculation, but the thinking only a couple years ago was that we were going to be aggressively switching away from fossil fuel so that even an indexed fuel tax would not be sustainable.

Since then, the clamour for the switch to electric vehicles has abated and the US (or at least the readership of its mass media) suddenly found itself awash in oil while peak car statistics took the spotlight from

“If our reasons and arguments [for road pricing] are so correct, sensible and optimal, why are they so often and for so long unaccepted?”

peak oil fears. The distancing of the peak oil threat makes it harder to build an audience for the electric car. Most people are concerned more with personal mobility than with climate change. If it is easier to boast US oil independence than it is to sell electric cars, then the funding sustainability argument will tip toward indexing the gas tax.

I am not suggesting that LaHood is wrong. In fact, if we took his suggestion we could close the funding gap immediately, regardless of any sustainability attributes. The heretofore ever-widening gap between the fuel tax we have outgrown and the transportation funding we need has been a boon to the MBUF argument.

Having an annual shortfall in the Highway Trust Fund that has required over US\$50 billion from the Treasury since 2008 has meant the MBUF argument has commanded some attention. If the US and its 50 states were to accept and act on LaHood's argument, the MBUF debate would get shelved and unless a new tax is devised for alternative fuels, vehicles that use little or no fossil fuel will be increasingly subsidized. This might increment the interest in alternative fuel use and a new urgency to reform user-pay could arise, based initially on equitability issues rather than funding gaps. Of course as the portion of subsidized drivers grows, the funding gap would be restored and the MBUF debate would return.

THE EVOLUTION OF AUTOMOBILITY

Automobility, which commonly evokes the narrow context of the automobile, truck or motorcycle, actually includes the full context of infrastructure, technology, management processes as well as related social, urban and health impacts and sometimes even our cultural dependence on these conveyances. But an even broader notion of automobility centered on autonomy and mobility leads us to consider a wider and deeper reason for the intransigence of drivers in the face of proposals that would threaten to limit the use of the private automobile. Having evolutionary roots, automobility is biological.

We are biased for automobility by the

“If it is easier to boast US oil independence than it is to sell electric cars, then the funding sustainability argument will tip toward indexing the gas tax”

reproductive advantages that superior autonomous mobility granted ancestral social groups of human nomads, gatherers, hunters, scavengers, warriors and conquerors. Any individual or group of humans that could travel faster, carry more, range farther, and kill more would tend to eat more, live longer, keep more wives and produce more offspring. This generalized automobility, entrenched long before Karl Benz or Henry Ford, was triggered by the domestication of donkey, horse, camel, and elephant. The advantage

of superior, power-assisted automobility has been wired into humans for at least 7,000 years.

The desire for autonomous travel operates at the same biological level as our evolutionary proclivity to wage group war⁵ and our deep social inclination to engage with religion⁶. Sociobiologist Edward O Wilson makes it clear that every trait we humans exhibit as a species can be traced back to a reproductive advantage for early humans.

When we ask drivers to use an alternative to the personal car, we are asking something more fundamental than most of us realize. Even the individual driver, focused only on time and convenience, or operating out of habit is unaware of the biological lock-in of his or her preference for automobility.

In his letter, Representative Bentz, avoided all nuance of demand management and focused only on the funding chasm. Regardless of any gaps in his logic, perhaps this strategy is likely to alienate his audience less quickly than we have alienated ours. Demand management sounds threatening to personal automobility in the unconscious, pre-urban cortex of the driver.

The problem is there are a lot of ways to find transportation money, but none



Biological lock-in: automobility is wired into humans and so asking drivers to use an alternative to their personal car is a much more fundamental issue than most of us realize

“Our inability to significantly educate journalists and satisfy drivers in the face of government distrust, personal entitlement, privacy fears, and low transit acceptance makes near-term adoption of MBUF highly unlikely”

are as sustainable, equitable and helpful in managing demand as are variable mileage-based usage fees. Designing user-pays systems that are acceptable, sensibly deployable, and sustainable in every regard appears to be unachievable given the current social paradigm of personal automotive ownership and use. These types of problems, known to sociologists as wicked problems⁷, are not only very difficult to solve, but it would also appear that our species is not ready socially for MBUF in many of the ways in which we have been promoting it.

BLIND MEN

Those who contemplate the benefits and harms of the automobile and what to do about them come from many disciplines: transportation economists, sociologists, urban planners, transport engineers, infrastructure builders, climate scientists, transportation psychologists, transit advocates, and behavioural economists. Arguments are numerous and, at this larger scope, even more contradictory. While we may nod agreement at a road-pricing conference, there is scant appetite from the political or motoring community for the solutions proposed. If we look at each idea and the habitual objections they engender, we find ourselves in a situation somewhat like that in the Indian parable of the six blind men examining an elephant. (Each one feels a different part, but only one part, compare notes and learn that they are in complete disagreement about what an elephant is.)

I offer this analogy with humility and disappointment. After a decade of reading, innovation, and conference participation, I have become convinced that no one of us on any side of these debates sees the entire

picture, or even that the problem description is stable long enough for anyone to do that. I have heard it said of both transportation and urban planning fields that “few understand anything and no one understands everything”. Solving the “automobile problem” has taken on the gravity and complexity of solving the social problems of religion and war. The evolutionary parallels are more than passing.

The science of social evolution is telling us something important. After 7000 years of human social evolution of automobility, it holds a powerful and fundamental lock on our sense of wellbeing, security, confidence, capability, reach and power. To address automobility in the face of culminating urbanization — including how to reform funding for critical infrastructure in democratic societies — we would do well to acknowledge the role of social evolution in the embedded human need for automobility and to recognize that while its ability to confer a reproductive advantage may have diminished or even become detrimental, its lingering, unconscious effects are real, powerful and able to avert policy and technology solutions.

To leave this unacknowledged means we will continue the current treadmill of conference and debate only to have all of our MBUF and VMT fee arguments continue to be deflected out of fear and distrust.

MBUF AND THE AUTONOMOUS VEHICLE

At the present time, there are clearly two significant barriers to an ideal system of variable mileage-based usage fees determined by time, place, and vehicle-type: system cost and low social acceptance. Costs can be engineered and marketed



away, but social acceptance is far more difficult.

We generally see low social acceptance as predicated on perceptions of privacy and taxation. The perceptions surrounding each of these are strong and negative, perhaps even more so in North America than in the EU. There are many policies and technologies that can address both of these objections but these require patience to explain and diligence to understand. Significantly, the arguments are not uniformly trusted.

Hence, our inability — in North America at least — to significantly educate journalists and satisfy drivers in the face of government distrust, personal entitlement, privacy fears, and low transit acceptance, etc., makes near-term adoption of MBUF highly unlikely.

Judging by the slow progress we are making toward a shift from fuel tax to MBUF, and the fact that the context of the problem slowly wanders and evolves, it would seem reasonable to guess that this change, should it occur, is two to four decades away. Consider also another momentous change that will be unfolding in the same timeframe: the autonomous vehicle (AV). Herein lies our opportunity.

As the deployment timelines for MBUF and the AV will follow very similar trajectories, the AV will serve to



diminish the urgency of demand-varied MBUF, as it is currently argued. As the AV is licensed and taxed for road use, transportation funding planners need to look forward to this newer, larger picture instead of dwelling on the faint hope of MBUF. The Stockholm and London road-pricing models are not only being snubbed by many, especially Americans, they are becoming passé and will become less appealing as we approach 2035.

Metering the AV for road-use fees is an approach that needs exploration, now. In fact, if the AV can help address infrastructure and funding sustainability, that alone is reason for government to start preparing AV policy and infrastructure — the two critical paths to sustainable automobility in 2040.

Consider that the AV will, of necessity, be fully connected. When you are in

an AV (whether you own it or not) time and location will be known at least to a robotics system and can be charged with full privacy according to market, replacement or demand value. The AV-MBUF fee, to give it an unwieldy name, will be bundled into your autonomous-taxi fee. If 90 per cent of the eventual AV fleet is publicly regulated and commercially operated, users will focus their entitlement demands on rapid, safe, reliable, always-available, low-cost automobility and less on the free-roads and privacy concerns that currently dominate push-back related to the MBUF approach.

AUTOMOBILITY AS A SERVICE

Observe that many technology trends increasingly push services into the cloud, and away from physicality and ownership. Bus, taxi and carshare are forms of transportation as a service, but each are flawed. The bus is a far cry from automobility, the taxi is expensive and often uncertain, a carshare vehicle still needs the user to operate it. Large, variegated fleets of autonomous vehicles can provide true transportation as a service (TaaS). TaaS from the AV can be far more personalized than bus or taxi and somewhat more than the current carshare fleet. And the AV can reach a far larger portion of people requiring automobility than can bus or carshare and much more cheaply and safely than a taxi. Superior in every regard, and with the automotive manufacturers building and managing TaaS fleets, regulations that ensure transportation funding are a critical opportunity. There is no need for governments to operate shared AV-taxi fleets, but there are reasons for them to provide infrastructure

and to require funding for that.

THE END OF DRIVING

The problem with automobility is not the car. It is the driver. It is the driver that uses oversized vehicles, drives aggressively or carelessly, bullies cyclists, hits pedestrians, drives under the influence, is unsafe, arranges to drive in congestion without thought of time or place, circles for free parking, and finds MBUF unacceptable. But the car per se, if managed efficiently is one of our most valuable assets for access and mobility.


While inter-city rail may still make sense in 2035 or 2040, the intra-city, 50-passenger, fixed-schedule bus will not⁸. If we want to address demand and funding, the autonomous vehicle will make a far better platform for road-use charging than would any of the mechanisms we have proposed so far. Remember over the next three decades, half of the current drivers will no longer be driving. This older half of drivers tends to hold MBUF in more disdain compared to the younger half⁹. Attitudes toward vehicle ownership and self-driving vehicles are already shifting, especially among these same, younger drivers. If we arrive in 2040 with the MBUF programming needed in 2014, we will confront a world of connected, shared, autonomous, vehicles in fleets that are owned and operated by multinational automotive makers.


We can be fairly certain of this because the automotive industry wants to grow. As peak car encroaches on their markets they will look to continually widening their service model. Daimler's Car2Go is a hint of that future.


What we need to do now is ensure that the MBUF demand-based concepts are converted to the self-driving fleets that will be the backbone of TaaS. We have already missed today's fleet. 🚗


Footnotes

- 1 Daniel Sperling and Deborah Gordon, *Two Billion Cars*, 2009
- 2 Paul Sorensen, *From Fuel Taxes to Mileage Fees*, ACCESS #43, www.uctc.net/access/43/access43_fuel_taxes.pdf
- 3 http://www.oregonlegislature.gov/bentz/Documents/pr_081313.pdf
- 4 <http://www.planetizen.com/node/65739>
- 5 David Livingstone Smith, *The Most Dangerous Animal: Human Nature and the Origins of War*, 2007
- 6 Edward O. Wilson, *The Social Conquest of Earth*, 2012
- 7 Bern Grush, *Wicked Problems Trusted Solutions*, *Thinking Highways*, Vol.5, No.2, 2010
- 8 Bern Grush, *Kiss Your Bus Goodbye*, *Traffic Technology International*, August 2012
- 9 Minnesota DOT, *Mileage-Based User Fee Public Opinion Study, Summary Report Phase III, Dec 2009*, pg. 41

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