THE CASE FOR FAIRNESS IN URBAN CONGESTION MITIGATION AND EMISSION REDUCTION MEASURES

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Abstract

An increasing number of metropolitan governments are proposing or have already implemented measures that have as their goal the reduction of vehicular congestion in and around their cities, and, concomitantly, the reduction of environmentally hazardous emissions. Many of these measures involve the establishment of a tolling system that charges drivers of motorised vehicles a sum of money when they pass into established zones and sometimes when they pass out of these zones. Charges are either a flat rate, as in London, or may vary according to time of day, as in Stockholm. Exemptions from paying the tolls, or reductions in the amount to be paid, are made in some cases, such as for low-emission vehicles or for public facility vehicles and for residents living inside the zones, but relief from paying the tolls is not given based on ability to pay. This is an unfair form of taxation which penalises the economically challenged citizens who must pay a higher proportion of their income to drive their vehicles, and rewards the economically advantaged with less congestion and fewer delays on the roads. This paper will explore why tolling schemes for urban congestion mitigation and emission reduction are unfair and discriminatory, and will present a case for alternative measures, especially incentives using voucher schemes, which would result in achieving similar goals while not disadvantaging certain groups of citizens.

Key words: congestion charging; hazardous emissions; save-as-you-drive; incentives; vouchers.

The Context for Mitigation and Reduction Measures

In urban areas around the world, traffic congestion mitigation and environmentally hazardous emissions reduction have been grouped together as inseparable parts of a single goal toward which public policy initiatives are addressed. Globally, transportation-related CO_2 emissions account for between 18% and 24% of total emissions, depending on which study is believed.[1] In the US, the amount is 33%, and in the State of California it is 41%. According to the IPCC 2007 report, fully 24% of the global total is transport related, with passenger cars comprising 7% of that total.[2] While transport related emissions are slightly more than deforestation (22%), and slightly less than industry (25%) and power and heating generation (27%), one-quarter is a significant amount and one that both local governmental policy makers and environmental activists believe can be reduced with the least amount of effort compared to the other offending categories.

Traffic congestion is a triple edged sword. It wastes time, increases harmful emissions and wastes fuel. Between 1982 and 2001, the average annual hours of delay per traveller for residents of city regions in the US of three million or more inhabitants increased by 38 hours.[3] In Los Angeles, 93 hours were wasted; in San Francisco it was 72; and in Washington, D.C. it was 69.

[1] IPCC lists the total as 18% for transportation with road transport as 13%, while …..

[2] IPCC Fourth Assessment Report, WG III, 2007. World Business Council for Sustainable Development, 2004.

[3] U.S. Department of Transportation, Federal Highway Administration, *National Household Travel Survey 2001*.

Studies have shown that adding one stop per kilometer for a vehicle travelling at 50 kilometres per hour doubles fuel consumption. Adding a second stop triples fuel consumption.

Traffic congestion also increases the amount of harmful emission spewed out into the atmosphere. Emissions increase as speed is reduced, and are at their worst when a vehicle is idling. Five minutes of idling per day, whether this is the result of being stuck in traffic, stopped at a red light or wastefully "warming up" the engine, results in an average of three hundred pounds per year of CO_2 emissions. For the US alone, this results in 1.4 billion gallons of wasted gasoline and 13 million tons of carbon dioxide.[4]

There was a time when traffic congestion was viewed as a solvable problem. Transportation planners in the post-WWII boom era of highway construction believed it was possible that more roads with more lanes and higher speed standards would solve the growing problem of congestion. Transportation texts written in the 1960s and early 1970s were less positive. They stated that any road built at that time would be congested at rush hour soon after it was opened. It was reasoned that congestion could not be eliminated, but its effective time could be reduced by building more roads and widening existing ones with more lanes so that the length of the traffic congestion periods would remain relatively constant as the number of vehicles entering the road system increased. Demand for space on the road would continue to grow because of increasing population and transfers from other transportation modes, but a form of equilibrium could be created with new construction.[5]

This view changed again among urban planners at the end of the 1990s. The principal proponents of new construction and the self regulation approach became the chief proponents of doing nothing: "Most people regard peak-hour traffic congestion as an unmitigated evil," said Anthony Downs to a US Senate Committee that had been established to review the environmental impacts of traffic congestion, "but that viewpoint is incorrect. Congestion is a vital de facto device we use to ration the scarce space on our roads during periods when too many people want to use that space at once. In effect, congestion is a balancing mechanism that enables us to pursue many other goals besides rapid movement—goals American society values highly. Those goals include having a wide variety of choices about where to live and where to work, working during similar hours so we can interact with each other efficiently, living in low-density settlement patterns, and enjoying highly flexible means of movement—that is, private vehicles. We must use delays from overcrowding in order to pursue the other goals we want to achieve. So congestion makes possible large-scale social benefits as well as the costs of delay on which most people focus when they think about it."[6]

I have analysed each of these positions supporting the inevitability of traffic congestion and determined that they are all refutable.[7] Nevertheless, Professor Downs succinctly summarizes the engineering viewpoint on the causes of traffic congestion and what should be done about it (i.e., nothing).

During the first decade of the 21st century, the environmental stakes were raised. Former Vice President Al Gore's Nobel Peace Prize winning efforts to increase environmental awareness by sounding extreme alarm bells collided with the views and interests of political, industrial and even scientific sceptics who claimed that global warming was either a fantasy or a temporary phenomenon that would eventually be corrected by an adaptable planet. In this context of opposing viewpoints, congestion mitigation and emission reduction efforts have become polarized. On the one side, extreme environmentalists see the reduction of car usage as a principal pillar of a total policy, along with the promotion of public transportation, the elimination of nuclear energy and promotion of

[4] Hinkle Charitable Foundation, Anti-Idling Primar.

[5] Anthony Downs, "Urban Problems and Prospects" *Chapter 7, The Law of Peak-Hour Expressway Congestion* (Markham Publishing Company, 1970). Reprinted from Traffic Quarterly, Vol. 16, No. 3 (July, 1962), pp.393-409, by permission of the Eno Foundation for Transportation, Inc.

[6] Anthony Downs: Testimony before the Committee on the Environment and Public Works, U.S. Senate (March 19, 2002).

[7] Sena, Michael L., "Beating Traffic: Time to Get Unstuck"; Chapter 2. (The Author House Publishing Company, 2007)

alternative energy sources, particularly solar and wind power. On the other side, extreme growth proponents oppose any attempts to restrict or increase the costs of car usage—especially increasing fuel taxes—they ignore public transportation and they lobby for increased exploitation of fossil fuels.

As often happens when opponents are forced to extremes, moderate voices are silenced and a singular approach adopted by each side becomes dogma.[8] In the case of the environmental extremists, their approach has taken the form of urban congestion charging along with support for electric, hybrid or biofuel vehicles. Sprawl restrictions may be added to the mix as well. In the case of the growth extremists, their approach has been to oppose congestion charging at all cost and promote unrestricted regional growth to take advantage of differentials in land costs.

Unless growth in urban regions declines, neither of these approaches on its own will have a significant or long-lasting impact on reducing traffic congestion or environmentally harmful emissions. Population growth will eventually result in the excess road capacity created by the initiation of tolls on the roads being eliminated, necessitating higher tolls. Unrestricted development will further decrease the chances for substituting collective transportation for private cars. In addition, each approach fails to take into account an important consideration, one that, since The Enlightenment, was considered to be absolutely essential in any deliberations that concerned the well being and the welfare of a society and its individual members, namely, *fairness*.

The Logic for Fairness

What is fairness? Something is 'fair' if it is just, reasonable, impartial or even handed. The best definition I have found for fairness is that it is *a compromise that is fair to both factions*.[9] Fairness therefore implies the existence of a minimum of two different and divergent points of view. Fairness is the absence of bias or favouritism in reaching a compromise between the opposing factions, and the total absence of a desire to obtain a selfish advantage. A fair policy for traffic congestion mitigation and harmful emissions reductions would not put one faction at a disadvantage to another.

Who are the factions? Any policy that institutes a payment regimen for using a good or service affects individuals in different income brackets unevenly, so one of the factions must be individuals in the lowest income bracket who still have the possibility of owning and operating a passenger car for private use. The opposing faction would be individuals in higher income brackets who can more easily afford to own a car. Most products and services apply market forces to price setting. Prices are set according to the real or perceived value to the consumer. When demand exceeds supply, prices rise and certain consumers are either forced out of the market (i.e. those in the lower income brackets who cannot afford to pay the increase), or choose to remove themselves voluntarily (because they substitute another product or service).

Some industries, like airlines and hotels, modify prices to distribute demand over different time periods, usually in order to avoid having to make investments in capacity increases. Those who are willing to pay the higher prices can use the product or service at prime times, while others must accept more inconvenient times, longer travel times, multiple plane changes, and so forth. Societies, in general, accept these pricing policies as long as they do not affect what are considered public goods in those societies.

Views on what constitutes a public good, however, vary considerably among societies. The debate on public health care in the United States during 2009, pitting the recently elected Democratic president and his party's members of Congress against their Republican counterparts, highlighted the difference of opinion on this topic between liberal social democrats, more typical of western European governments, and the social conservatives who have been responsible for steering governmental policies in the US for six decades.

The economic principles behind congestion pricing are simple: recover the difference between the marginal private costs and marginal

[8] Fölster, Stefan: Färväl till världsundergången, Bonniers Förlag (2008).

[9] Random House Dictionary, © Random House, Inc. 2009.

social costs of using cars in order to expose drivers to the full social cost of road use through directly charging for those costs that vary with congestion.[10] Roads are viewed as a scarce resource, and congestion charging is simply a method used to shift some drivers to non-congested periods, to other modes of transportation, to alternative (i.e. non-congested) routes, and into car pool programs in order for traffic to flow more smoothly. The problem economists saw was that roads were perceived as 'free', and anything that is free to an economist will be consumed as much as possible until it is totally used up. With roads, 'used up' means congested. This is referred to as a 'Tragedy of the Commons', a condition in which anyone with access to a common resource has an interest in over-exploiting it because if he or she does not, someone else will.[11]

Congestion charging was successfully used in Singapore to keep main roads free of congestion, but its first major application in Europe was in London in 2003.[12] Then-mayor, Ken Livingstone, proposed it as a solution to London's intractable traffic congestion problem. It was declared a success because an estimated twenty percent of trips into the designated central London zone were eliminated. City governments around the world rushed to prepare for introducing schemes of their own. Stockholm succeeded in building its proposal in spite of strong opposition from surrounding communities. Manchester, UK and New York City were not so lucky. Voters in Manchester vetoed their council's scheme, and New York State legislatures denied Mayor Bloomberg a license to put a congestion charging ring around his city.

[10] This is the total cost to society as a whole for producing one further unit or taking one further action, as well explained in Assessing the Economic Effects of Congestion Pricing, prepared for the Oregon Department of Transportation by Cambridge Systematics, Inc. (February 3, 2009).

[11] 1832 William Forster Lloyd, a political economist at Oxford University, looking at the recurring devastation of common (i.e., not privately owned) pastures in England, asked: "Why are the cattle on a common so puny and stunted? Why is the common itself so bare-worn, and cropped so differently from the adjoining inclosures?"

[12] It is more correct to say that it was a reapplication since central London had in 1856 as many as 117 toll gates within a six-mile radius of Charing Cross in spite of an 1825 ruling to eliminate them because they caused undue inconvenience and disruption of commerce.

Where Context and Logic Converge or Diverge

Opposition to congestion charging is chiefly on the grounds of unfairness, that citizens feel they are paying a second or third time for a good or service that they already paid for through a municipal, excise or fuel tax. Further, following the institution of congestion charging, most of those affected by it are worse off than they were prior to it because they are charged for something that formerly had been free: the benefits of travel and the impacts of their travel on others.[13]

The principal problem with the economists' and the environmentalists' view on car usage is the belief that individuals have a choice on time, route or mode of travel when it concerns the most important need for mobility: work. This is not always the case. Work times are relatively fixed (an average of 80% of work is performed during the 9-to-5 shift); residential choices are decidedly income-related (i.e., people live where they can afford to live, not necessarily in close proximity to their jobs or potential job opportunities); and alternatives to using one's private automobile for transportation between home and work are often either non-existent or exceptionally inconvenient. Work-related transportation usage represents between 30% and 50% of all car journeys taken during a year, depending on the country and region, and car journeys as a percentage of total journeys compared to other modes (e.g., walk, bus, bicycle or rail) is between 50% and 65% in Europe and up to 90% in the US.[14]

The public transit paradigm is based on a high density focal point, the central business district, where transit riders end their journeys. This was the model of most urban areas until the 1980s, but today in many countries, more people live in the suburbs and a greater percentage of jobs are located there. There are in fact two tiers of suburb, lower-income which are mostly contiguous to the central cities, and the higher-income suburbs which form an outer ring. In the US, 65% of all residents and 60% of all jobs

[13] Cervero, Robert. The Transit Metropolis, Island Press, Washington, D.C., pp. 67-68. (1998)

[14] UK Office for National Statistics; Journeys per man per year: by age and main mode of transport, 1997-1999.

were located in suburbs according to information gathered in the 2000 US Census of Population. The growth rate for employment has been highest in the higher-income suburbs. For that reason, reverse commuting (travelling away from the central city during the morning commute) and cross suburb commuting are now the norm, and these conditions favour the private car over public transportation.[15]

Raising the price of owning and operating a car is one of the worst forms of discrimination against the poor. Not having a car or a driver's license is a severe handicap in obtaining and holding a job.[16] Research by the U.S. Federal Reserve Bank shows that people who own cars are more likely to be employed and to work more hours than those who do not own cars; that access to a car shortens periods of unemployment; that car ownership equals increased earnings, especially among racial minorities and low-skilled workers; and, that welfare recipients who received cars through a car ownership program increased their earnings and reduced their dependence on public support payments.[17]

Instituting congestion charges in urban zones will therefore have two eventual effects: they will hasten the flight of jobs that remain in the urban cores to areas outside the congestion zones, reducing work opportunities for lower income workers living in cities; and, they will increase the costs for lower income workers who must commute into or out of the congestion zone on a daily basis.

If it is accepted that concentrating jobs in the most accessible locations for all residents of a region will result in the most efficient use of the transportation network—both collective and private alternatives—then it follows that such a policy would reduce both traffic congestion and the harmful emissions that result from this congestion. The most accessible locations in a region are a function of several variables, principally the topology of the transportation network and the speed of travel on this network. Speed of travel is a direct function of the capacity of the network and the number of users on the network at any given time. All of this can be easily modelled, and if public planning policy were actually related to maximizing overall accessibility of all residents in a region to the principal generators of movement (i.e., jobs and education) the level of congestion on roads would be substantially lower.[18]

Changing land use policies to restrict real property from being developed according to the widely accepted principle of 'highest and best use'[19] will be difficult, although ultimately it will be necessary. *Brown Field* development must replace *Green Field* exploitation in order to concentrate origins and destinations in the most accessible locations.

Conflict Resolution

More alternatives need to be considered, their total costs and benefits evaluated, and decisions made on the basis of both environmental consideration and societal benefit. Fairness must be a deciding factor because if a program is deemed to favour certain groups over others, ways will be found to sabotage the program. In the case of instituting congestion charging zones, sabotage will take the form of attempting to avoid paying the charges or encouraging drivers to avoid travelling into the zone. For example, businesses can move outside the zone, further reducing the effectiveness of collective transit alternatives.

It will take several generations before development policies, once changed, can be implemented. There need to be viable options today that enable essential transportation to flow freely and which allocate space on the

[15] Holzer, H.J. and Stoll, Michael A.; Where Workers Go, Do Jobs Follow?; Metro Economy Series from the Metropolitan Policy Program at Brookings (December 2007)

[16] UK Census Deprivation Study.

[17] Federal Reserve Bank of San Francisco. Community Investment Online, *Working Wheels*, 2005.

[18] Lozano,E.E., Sena, M.L., Heitzmann, D. and Cheng, C.H., 'Level of Services and Degree of Accessibility Spatial Urban Simulation Model', *Regional Studies*, Vol. 8, No. 1, (March 1974), pp. 21-45.

[19] A real estate concept used in appraisal stating that the value of a property is directly related to the use of that property, and the highest and best use which is legally allowable, physically possible, financially feasible and maximally productive produces the highest property value.

transportation network in a fair and equitable manner. A novel approach to this problem that shows incentives do indeed work has been tried in The Netherlands.[20] During September 2008 and May 2009, eight hundred volunteers participated in a test that was held on the A12 between Gouda and The Hague in The Netherlands. The route was divided into two zones, the first from Gouda to Zoetermeer and the second from Zoetermeer and The Hague. Participants in the test earned €4 if they did not travel in one of the zones (€8 if they avoided both zones) during the period 06.30 and 09.30 for the first zone and 07.00 and 09.30. Results of the test were a 50% reduction of use of each road stretch by the participants in the test. They travelled outside the zone, used alternative modes of travel, or worked from home. Most used alternative routes, continuing to travel by car, but outside the zone. The majority of the participants were in the higher income percentile, indicating that they had the greatest amount of flexibility in working times and places.

The same article reported a second test in The Netherlands, this one involving public transport. Participants in the test conducted by Dutch Railways paid 20% lower subscription rates for their monthly passes for travel between Utrecht and The Hague, a highly trafficked route, if they did not travel during the period between 07.30 and 09.00. Most of the one hundred twenty-four participants travelled just before or just after the peak period.

One incentive concept that I have been investigating is the allocation of travel vouchers to each person in a region who is of driving age and/or at the age when they must pay for collective transportation. Each person would receive an equal number of vouchers that can be used for any type of travel during a fixed time period, such as a month, quarter or a year. The fundamental difference of a voucher system compared to a payment system is that each person is guaranteed a basic level of access to the transportation system, irrespective of income. Travel is therefore not based on ability to pay but on the need to travel.

Voucher systems already exist, or have existed, in many different forms. Fuel rationing schemes during wartime and periods of extreme shortages are a type of voucher system. Fuel was purchased with stamps, and the number of stamps sold was severely restricted. Pre-paid SIM-cards are used by parents to limit their children's prolifigate use of their mobile phones. Some school districts, or even entire countries (e.g. Sweden), have adopted a voucher system to allow students to select the school they choose to attend, neutralizing the effects of income differentials and places of residence.

A transportation voucher system is based on two premises:

- Everyone has an equal right to the transportation network (roads as well as collective transportation) that has been constructed with public monies, irrespective of age, income or personal handicaps; and,
- Usage of the transportation network must consider environmental factors on an equal basis to business and social factors.

Following from these two premises, the total amount of travel allowed on the network (combined road and collective transport) following the institution of a voucher scheme may not be less than before the scheme was put into effect, but the total environmental impact of this travel should be reduced.

The number of vouchers allocated would allow a person to travel to and from his or her place of work or schooling during the time period, and allow for routine travel that is not job- or school-related, such as shopping, church attendance, recreation. The value of the vouchers could be weighted in favour of collective transportation if such an alternative exists so that a trip of the same distance would require fewer vouchers if used for bus or rail travel than if used for car travel. Incidental travel would require more vouchers during the peak work- and school-related than if these trips were made at off-peak times.

Road space rationing has been proposed previously as a method to address the inequality issue of road user charging. Viegas, and others, suggest that The "local taxpayers receive as a

[20] *Verkeersnet.nl, Automobilisten vermijden de spits tegen beloning, 8 september 2009. (Translation provided by Joost van den Bosch)*

direct restitution of their tax contribution a certain amount of "mobility rights", which can be used both for private car driving in the tolled areas and for riding public transport".[21]

If vouchers are not time-limited and non-transferable, it is likely that they would be sold by those who require the minimum of transportation (e.g., those who live relatively close to work or school) to those who can pay the most for the vouchers and who require (or desire) the largest number to travel by car. This will increase the market value of the vouchers and encourage lower-income individuals to sell their allocation to increase their incomes, rather than using the vouchers productively to reach a higher-paying job or attend a higher quality school. Therefore, vouchers should not be transferable and they should be used only during a specified period of time, preventing hoarding.

For a voucher system to work, both from the viewpoint of fairness and from the perspective of environmental impact and congestion reduction, it must be connected to the person using it and to their vehicle, not to a household. For example, if a husband and wife share one car to travel to work, the owner of the vehicle might pay three-quarters of the full number of vouchers for the journey, while the passenger might pay one-half. The more individuals who share the ride, the fewer would be the number of vouchers each would have to use. Driving children to school, rather than encouraging the use of the school bus or other collective transportation, might require more vouchers than a work trip of similar distance. The basic idea is to encourage carpooling, ride sharing and collective transportation usage.

Another practice that can be encouraged by a voucher system is multi-modal journeys. This can be done by requiring fewer vouchers to travel to a parking garage on the periphery of an urban area and completing the journey by bus or other transit mode, rather than making the complete trip from home to a destination in the centre of city by car. This requires the existence of multi-modal park-and-ride facilities like those been built on the inner ring road around Greater Boston in the US.[22] Such facilities, and the rest of the infrastructure needed to support a voucher system for transportation, will have to be constructed, but the cost of this infrastructure should be more than paid for by the benefits generated by a system that engages the entire population of a region in reducing travel and encourages them to switch their modes of travel to those which are the least costly and most efficient—without forcing them out of their cars simply because they cannot afford to pay a toll for entering into a zone or driving along a stretch of road.

Realisation

A voucher system for transportation would have been unthinkable before enabling technologies became available and reached maturity. Today, all the individual components needed to implement a voucher-based transportation system exist. The task is only to piece them together once a political and social consensus has been reached.

Smart Cards for public transit are already in use. Transit riders swipe their cards on special readers at the beginning and end of their journeys or when they change lines or modes. For pre-paid debit cards, the cost of each journey is deducted automatically from the card holder's account. The cost of the cards is based on the age or other relevant vital statistics of the card holder and the transit policies of the region. The step up to *Really Smart Cards* that will encompass car travel as well as transit usage is not that much of a stretch. The basic technology for monitoring distance driven and actual choice of roads travelled has been developed for a number of in-vehicle applications, from navigation and pay-as-you-drive (PAYD) insurance systems to emergency call and toll collection systems.[23] The in-vehicle wireless communications capability also exists to report usage and process payments. Navigation systems reinforced with map data identifying traffic congestion problems and

[21] *José M. Viegas "Making urban road pricing acceptable and effective: searching for quality and equity in urban mobility". Transport Policy, Vol 8, Issue 4, October 2001, pp. 289-294.*

[22] Sena, "Beating Traffic", op.cit, *Chapter 4: Too Much of a Good Thing*.

[23] Toll Collect: A distance-based tolling system for all trucks from inside and outside Germany with a gross vehicle weight of twelve tons and above. Toll Collect is the service provider who calculates and collect road usage charges based on the distance travelled.

sensitive environmental zones are also now available.

The PAYD model (also known as User Based Insurance, or UBI) is perhaps the closest to an operational system for application to transportation vouchers. PAYD systems allow a driver to pay for his or her car insurance based on a combination of factors which are measured by a device that is installed in the vehicle, rather than paying a flat rate calculated by the insurance company's actuarial tables.[24] This device collects information about the distance driven, the roads on which the driving occurs, the time of day the driving takes place, and, in some instances, the driving behaviour of the driver (e.g., high-speed turns, rapid acceleration and deceleration are penalized). Information is passed over to the insurance company via wireless technology built into the PAYD systems. The insurance companies process the data and calculate a premium that the driver pays on a monthly, quarterly or annual basis.

The idea with PAYD is that it should pay to drive less and to drive in less risky ways. It should really be called Save-As-You-Drive (SAYD). Driving less and more carefully can also be said to reduce hazardous emissions and traffic congestion. For example, rapid acceleration wastes fuel and pours out higher levels of CO_2. With *Really Smart Card* technology, an in-vehicle system would allow the driver and eventual passengers to separately log their travel by simply being present in the vehicle. The system would read the cards of everyone sitting in the vehicle, debit the appropriate amount of travel on their cards and record the journeys for each of the travellers. Each person would have his or her own profile indicating age and place of work or school. Each person would be debited a number of voucher points on the basis of how and when the trip was made. For example, zero points would be debited for making the journey on foot or by bicycle, some points for a journey made by bus or other public transit, and more points for a journey made by car. Non-work and non-school journeys would be debited according to a pre-determined formula built around the circumstances of each geographic region and each individual's living conditions, including income.

The principle of fairness must be paramount. Individuals must feel that they have equal access to the transportation infrastructure and are contributing equally to both the smooth operation of this infrastructure and the minimization of their travel's negative environmental effects. This is why vouchers should not become a tradable commodity. Everyone should feel he or she is equally responsible for the level of traffic congestion they create and the amount of harmful emissions they generate. It should not be possible to buy someone else's good behaviour and use it as one's own.

The key to acceptance of a transportation voucher system is having appropriate incentives for each user group. A car owner may modify her or her own driving behaviour in order to marginally lower annual insurance premiums, but it will take more than marginal reductions to move drivers into public transit alternatives—when they exist—to encourage car pooling by adults, to discourage parents from driving their children to school in favour of walking, biking and taking the bus, and to promote the development of small, localised shopping and recreation alternatives that do not require long distance drives. Ideally, it should be enough to say that the reason for complying with the voucher guidelines is that society has decided it is in society's interest to do so. The debate over climate change, the lack of consensus over whether global warming is a threat or a myth, and what to do about it if the planet is truly in peril, indicates that depending purely on the good intentions of the citizenry will not suffice. We do not live in an idealised world.

Incentive models exist. Most of them reward heavy users of goods or service. Frequent flyers are given free trips, frequent hotel users are given free nights. Rewarding reduced amounts of car driving by offering "free" car travel would be counter-productive, although offering long-

[24] Traditional car insurance premiums are currently calculated principally based on the age of the driver, the driver's car storage location and the driving record of the premium holder. Young (i.e., 16-24-year-old) drivers pay higher premiums because statistics show that they are more prone to accidents. Urban dwellers pay higher premiums because the risk of theft and damage has been found to be higher than in suburban areas. Individuals with a history of accidents and reckless driving are also placed in the high premium category.

distance travel awards for vacation trips or weekend outings on a one-for-two or one-for three basis could be a good way to trade congestion time trips for off-peak or low traffic trips. Rewarding reduced amounts of car travel with free transit travel would be a more positive incentive, but taking the train to the mountains for a ski vacation in Idaho would be a challenge.

Another approach would be to allow unused vouchers to be redeemed for products that promote clean travel and energy conservation. Products could be donated by producers as part of their advertising campaigns. Voucher savers could also be encouraged to save up for big prizes, such as a year's supply of electricity for a plug-in electric vehicle or for the vehicle itself.

Recapitulation

Punitive methods for mitigating traffic congestion and reducing harmful emissions, especially those that place the burden of compliance unfairly on certain groups of citizens, have not proven to be either effective or long-lasting, and the types and degree of collateral damage that could result are still unknown. Doing nothing and accepting uncontrolled exploitation of the transportation network and the environment is also not a sustainable approach to preserving the planet for future generations. Equitably allocating access to the full transportation network, but encouraging a more limited amount of usage of this network through a combination of across the board reductions for everyone and the offering of personal incentives using voucher schemes, is an approach that deserves to be tested.