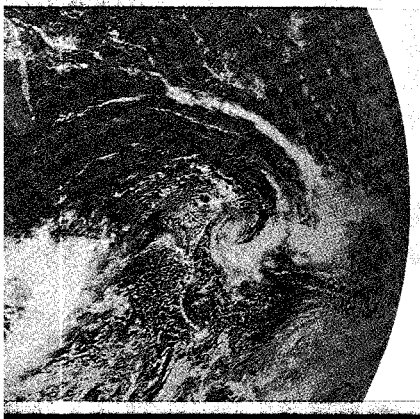

THE GOING RATE:

WHAT IT REALLY COSTS TO DRIVE

James J. MacKenzie
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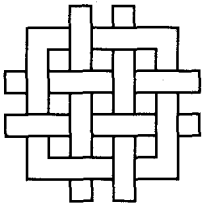

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Kathleen Courrier
Publications Director

Brooks Clapp
Marketing Manager

Hyacinth Billings
Production Manager

James J. MacKenzie; American Public Transit Association
Cover Photos

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J.J.M.
R.C.D.
D.D.T.C.

FOREWORD

Have you ever wondered why public transit service in the United States is so poor? Or why the air is unhealthy despite all the pollution control efforts? Or why traffic gets worse even though we keep building more lanes and more roads? Or why we are importing nearly half our oil, about one third of it from the Middle East? Or why European cars get so much better gas mileage than American ones? The answer, as is often the case, lies in the economics: operating private motor vehicles in the United States today is deeply subsidized, and we do it to excess.

The costs of getting around on four wheels are becoming clear to everyone who takes an honest look, but little work has been done to understand the economics of it all. If drivers had to pay by the mile until the whole bill were covered, sliding behind the wheel would lead to even more sticker shock than a visit to the neighborhood car dealership.

In *The Going Rate: What it Really Costs to Drive,* James J. MacKenzie, senior associate in World Resources Institute's Program in Climate, Energy, and Pollution; Roger C. Dower, director of the program; and Donald D. T. Chen, an independent environmental analyst, explore the full costs of a transportation system dominated by private motor vehicles. The report estimates what the "polluter pays" principle and its logical extensions would mean for the country that pioneered the automotive revolution and leads the world in oil imports and emissions.

MacKenzie, Dower, and Chen argue that the American dream of a car—or two or three of them—in every garage poses real risks to our health, our energy security, and the global environment, now that Americans log 2 trillion miles behind the wheel each year. The authors calculate that the full costs of driving, if totted up at the gas pump, could raise the price of gasoline by several dollars a gallon.

All told, the costs of driving that motorists and truckers don't shoulder come to some $300 billion a year, say the authors. An illustrative handful of details suggests how much society at large is paying:

- Gas taxes and other user fees covered only about 60 percent of the $33.3 billion governments spent on building, improving, and repairing roads in 1989; the rest of the money came from taxpayers and other sources.
- An estimated $68 billion not covered by user fees is spent each year on such services as highway patrols, traffic management, parking enforcement, traffic accident response teams, policework on auto accidents and thefts, and routine street maintenance.
- The costs of vehicular air pollution are hard to pin down because they include such elusive damages as illness, premature death, and reduced crop yields; but even at the low estimate of $10 billion a year, they are substantial—and all of them are borne by society at large.
- Since motorists use about half of imported oil, up to half the cost of maintaining a U.S. military presence in the Middle East—or $50 billion a year—could be considered part of what driving costs.
- By accounting for about 25 percent of U.S. carbon dioxide emissions, driving also increases the risk of climate change. The range of possible consequences of a warmer world is so wide and uncertain that estimating costs is impossible, but everyone will pay in some measure.

There are other incalculable losses too, of course, such as the 47,000 people killed in motor vehicle accidents—about one in five while walking or riding a bicycle—in the most recent year for which statistics are available.

What policy changes are needed to lower this toll and ensure the development of a balanced transportation system? The authors discuss a number of measures that would help, including enacting fuel taxes that would raise the cost of gasoline, levying road tolls based on time of day, reforming employer-paid parking, and raising charges on truckers. They also make the case that long-term changes in zoning laws will be needed to encourage greater residential population density if public transit is to become a

viable option in more places. The authors assert that enacting such a package of changes would be far more sensible than building more and more roads, only to see many of them fill up within days, as clogged with traffic as the old roads they were designed to replace. Besides saving the time now lost to stop-and-go traffic, imposing user fees on motorists and truckers would encourage demand for new energy-efficient and even emissionless vehicles and for alternative modes of transportation. The end result would be more transportation options all around—and less pollution, less wasted time, and less aggravation.

The Going Rate is the latest in the World Resources Institute's series of reports on climate, energy, and pollution policies. The policy recommendations spelled out in this report extend those of such previous studies as *Driving Forces: Motor Vehicle Trends and Their Implications for Global Warming, Energy Strategies, and Transportation Planning; Breathing Easier: Taking Action on Climate Change, Air Pollution, and Energy Insecurity;* and *Ill Winds: Air Pollution's Toll on Trees and Crops.*

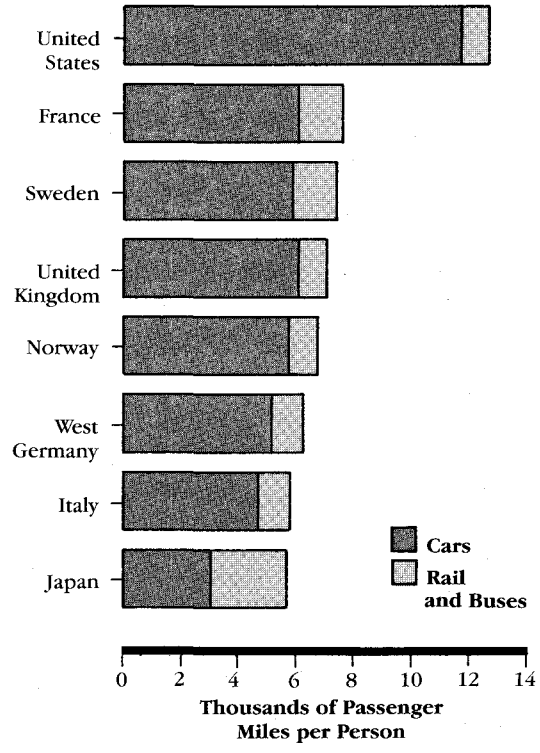
Financial support for WRI's work on transportation and other climate and energy issues has been provided by The Nathan Cummings Foundation, The Joyce Foundation, The William Penn Foundation, Public Welfare Foundation, Inc., Rockefeller Brothers Fund, W. Alton Jones Foundation, and The George Gund Foundation. To all these institutions, we express our deep appreciation.

James Gustave Speth
President
World Resources Institute

I. INTRODUCTION

No other country in the world depends as heavily on motor vehicles as the United States does. In per capita use, no other developed country even comes close. The average American drives or rides about 12,000 miles per year in cars and light trucks, almost double the distance traveled in most other industrial countries.[1] *(See Figure 1.)* Even in urban areas, where people are the most likely to have other transportation options, Americans use motor vehicles for 82 percent of their trips, compared with 48 percent for Germans, 47 percent for the French, 45 percent for the English, and 42 percent for Danes.[2] In 1990, there were a record 190 million motor vehicles registered in the United States—23 million more vehicles than licensed drivers—and no end to the growth in the number of vehicle miles traveled (VMT) is in sight. *(See Figure 2.)*

Figure 1. Per Capita Car and Light Truck Travel (1987)



Thanks largely to motor vehicles, hyper-mobility has become almost an American birthright.

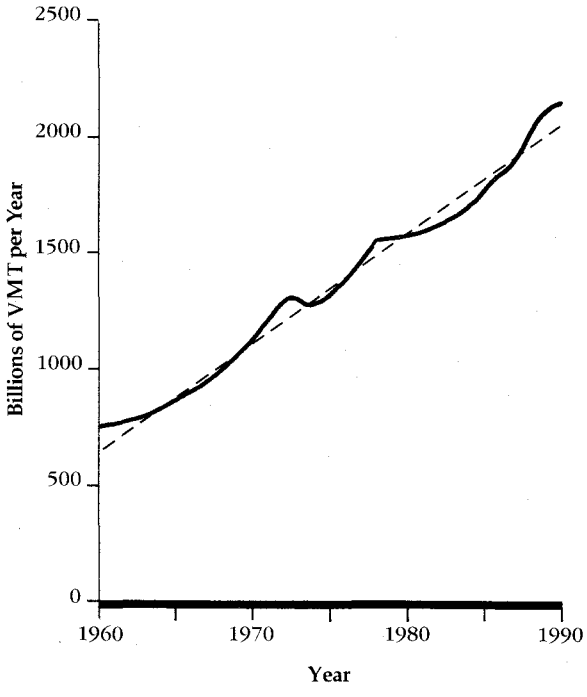
Thanks largely to motor vehicles, hyper-mobility has become almost an American birthright. Per capita motor vehicle use (cars, trucks, buses, etc.) has almost tripled, from three thousand VMT per person in 1950 to over 8700 in 1990, a compound growth rate of 2.6 percent per year. *(See Figure 3.)* Affordable motor vehicles and inexpensive fuel have brought American car owners freedoms and opportunities that few other countries can even hope to match and that were scarcely imaginable just a few decades ago. At the same time, the expanding truck fleet has enabled industry to move goods quickly and conveniently to markets.

Yet, a forty-year focus in U.S. transportation policy on motor vehicles as the answer has made Americans lose sight of the question. The longstanding commitment to personal vehicles has led to interstate and urban highways that at least until recently have been the world's envy, to suburban developments, to shopping malls, and—coming full circle—to the world's highest per capita motor-vehicle use. The quest for personal mobility may now be interfering with the good life instead of contributing to it.

The quest for personal mobility may now be interfering with the good life instead of contributing to it.

Billions of dollars have been spent to build, maintain, and repair our highways and roads, and billions more are needed to keep them in good condition. Besides the financial burden this represents, compelling evidence reveals that our commitment to

Figure 2. Trends in Total U.S. Motor Vehicle Miles Traveled



automobiles and trucks threatens our health, security, and the natural environment. Ironically, as congestion increases, ownership of a motor vehicle no longer guarantees mobility and quick access to services and places beyond the neighborhood or the reach of public transportation.

In many parts of the country, rush-hour and even weekend congestion is slowly strangling entire metropolitan areas. Along with increased stress and tension, congestion leads to lost time, lower worker productivity, increased air pollution, more accidents, and wasted fuel. A transportation system dominated by vehicles also contributes to other national problems—and tragedies—including 47,000 deaths and five million injuries (the toll in 1988).[3]

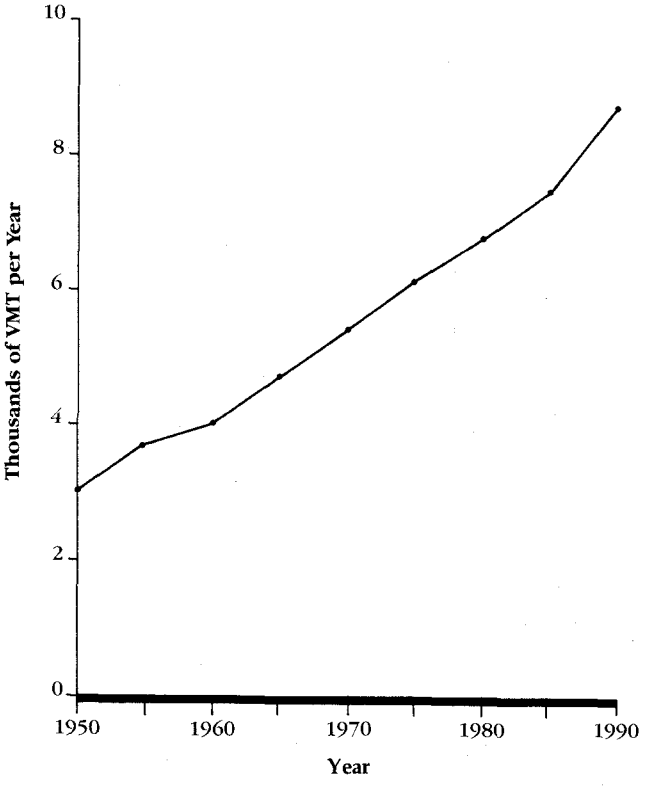
The social, economic, and environmental costs resulting from these trends have sparked widespread concern over whether—and at what price—growing motor vehicle use can be sustained. The Federal Highway Administration expects congestion to grow fourfold on the nation's freeways and twofold on other roads over the next twenty years.[4] According to the Transportation Research Board, part of the National Academy's National Research Council, annual delays in travel time will increase by 5.6 billion hours over the next two decades, wasting an additional 7.3 billion gallons of fuel per year, annually adding 73 million tons of carbon dioxide to U.S. emissions, and increasing travelers' costs by $41 billion.[5] The end results of such congestion border on the absurd: a one-way 30-mile commute on U.S. Route 1 from New Brunswick, New Jersey to Trenton could easily turn into a five-hour ordeal by 2005, as traffic inches along at an average speed of six miles per hour, slower than a trotting horse.[6]

The prospect of immobility is only part of the problem. Increased driving frustrates the achievement of national goals such as clean air, energy security, and protection of the environment. If motor vehicle use continues to grow, as expected, the

BOX 1

Traffic congestion is not a new problem and trying to build more highways to alleviate it is not a new solution. In "The Power Broker," a biography of Robert Moses, New York's planning czar during the 1930s, Robert Caro describes the frustration of trying to cut traffic by focusing on the construction of more roads and bridges. "Watching Moses open the Triborough Bridge to ease congestion on the Queensborough Bridge, open the Bronx-Whitestone Bridge to ease congestion on the Triborough Bridge and then watching traffic counts on all three bridges mount until all three were as congested as one had been before, planners could hardly avoid the conclusion that 'traffic generation' was no longer a theory but a proven fact: the more highways were built to alleviate congestion, the more automobiles would pour onto them and...force the building of more highways—which would generate more traffic and become congested in their turn in an inexorably widening spiral that contained the most awesome implications for the future of New York and of all urban areas...Pour public investment into the improvement of highways while doing nothing to improve mass transit lines, and there could be only one outcome...Moses' immense new highway construction proposal...could only make congestion, already intolerable, progressively worse. His program...was doomed to failure before it began."[7]

Figure 3. Average U.S. Per Capita Motor Vehicle Travel



prospects for further reducing urban air pollution and U.S. petroleum imports are dim. Yet, by the year 2010, total fuel consumption by U.S. motor vehicles could increase by as much as 50 percent over today's levels.[8] Even today, with less than 5 percent of the world's population, the United States consumes a quarter of the world's oil, and one half of this—about 8.9 million barrels per day—is burned in motor vehicles.[9] With domestic oil production declining, following our current transportation policies will deepen U.S. dependence on foreign oil sources, increasingly from Persian Gulf producers, further jeopardizing national security and adding to greenhouse-gas emissions.

Growing frustration with what four decades of furious highway building has wrought emerged in the vigorous debate surrounding the passage of the 1991 surface-transportation act, a law that greatly increased the funds available for public transportation. Although the era of massive highway building is ending, the United States still spends nearly $200 million every day building and rebuilding the nation's streets and roads, despite predictions that congestion and delays will worsen.

II. THE EFFECTS OF DISTORTED PRICES

Today's heavy use of cars and trucks in the United States did not just happen. Nor did it spring solely from some peculiarly American love affair with the automobile. Rather, economic and political forces that partially mask the full costs of driving are at work. Motorists today do not directly pay anything close to the full costs of their driving decisions. However steep the bills for cars, insurance, automobile maintenance, and gasoline may seem to drivers, federal and state policies spare them many other costs. The net effect of these policies is to make driving seem cheaper than it really is and to encourage the excessive use of automobiles and trucks.

What are the annual social costs of driving that motorists don't pay directly out of pocket? And what policy changes are needed to better account for them through user fees and charges? Answering these questions—the purpose of this report—is by no means a straightforward task. But following the "polluter pays" principle of cost allocation, as recommended here, would begin to shift the various costs associated with motor vehicle use to the drivers who impose them.

Some analysts may object to shifting all of the costs of motor vehicle use to drivers, arguing that roadways provide some public benefits that would justify partial public payment for, say, highway construction and repair. But any such benefits are quite difficult to measure and, in any case, are likely to be small compared with overall private benefits. In this report we allocate all costs directly to the motor vehicles—both public and private—that impose them.

From a purely economic point of view, imposing user charges that reflect the costs of driving will not necessarily lead to economically optimal levels of driving or to the wisest investment in roads, bridges, and other driving-related facilities. (Such optimal levels would be determined by finding the point at which the marginal social costs of driving equal the marginal benefits, either in the short or long term.) Still, imposing fees on users—that is, the driving population—is consistent with theories of cost allocation that call for drivers to bear the costs they impose. Imposing user charges that better reflect the full costs of driving is likely to reduce levels of inessential driving and, perhaps, increase demand for transportation forms other than motor vehicles.

Finally, even when drivers as a group pay the costs of driving it may be possible to charge heavier fees on those drivers who impose greater costs. The costs of accidents, for instance, could be pro-rated so that highest-risk drivers would pay the most. Some policy initiatives that would accomplish such a shift are proposed at the end of the report.

III. MARKET COSTS AND EXTERNALITIES

The costs of driving can be categorized as either "market" or "external." Market costs are those that are actually reflected in economic transactions, such as purchasing a car, buying fuel to operate it, constructing and repairing roads, paying for parking spaces, or purchasing automobile insurance. Market costs represent the direct, ordinary, expected costs of owning and operating a motor vehicle. In contrast, external costs (or "externalities") are not reflected directly in market transactions. These hidden costs include those for illnesses resulting from motor-vehicle air pollution and the economic risks from increased global warming and dependence on imported oil. External costs obviously must be estimated using techniques other than analyzing normal market prices. Social costs are the sum of market and external costs—in short, total costs.

Making motor vehicle users bear their fair share of the total costs of driving would help curb the problems stemming from our current transportation system—congestion, excessive air pollution, growing greenhouse gas emissions, and endangered national security, to name a few. But, for several reasons, motor vehicle users rarely face the full costs of their driving decisions.

Government taxing policies frequently shift some of the direct costs of driving away from drivers. In this way, drivers fail to bear directly a significant fraction of road construction and repair costs, the costs of providing highway services, and the costs of providing commuter parking. In the case of externalities such as air pollution, climate-change risks, and noise, everyone shares the costs, but those who impose the costs pay only a fraction. Finally, some categories of costs paid by drivers don't bear any direct relation to their driving decisions or the costs of these decisions. For example, drivers pay some accident costs in the form of medical expenses, lost work time, or premiums for accident insurance, but accident insurance costs are not always pegged directly to the amount of driving or the actual risks imposed by specific drivers.

To the extent that the price of driving—as reflected, for example, in the prices of cars, gasoline, and road fees—does not include all of these costs, people drive more than they otherwise might and shy away from competing transportation systems—such as public transportation or bicycles—that can provide comparable services at lower social costs.

The enormity of the problems spawned by the use of cars and trucks in the United States demands a full accounting of these unborne social costs. Without such information in hand, the comparative advantages and drawbacks of using, say, tolls, service charges, or fuel taxes to incorporate these costs into driving decisions will be hard to assess.

IV. MARKET COSTS: PAYING THE BILL FOR ROADWAY CONSTRUCTION, MAINTENANCE, HIGHWAY SERVICES, AND PARKING

The annual costs of building and maintaining highways and roads are paid by governments at all levels. In 1989, federal, state, and local governments spent roughly $33 billion constructing, improving, and rehabilitating highways, streets, and roads.[10] An additional $20 billion was spent on maintenance, $6.4 billion on police and safety services, $5.4 billion on administration, and $6.3 billion on interest and debt retirement.[11]

Roughly speaking, this $71 billion represents the annual costs of capital and operating investments in U.S road construction and maintenance. About 60 percent ($44.3 billion) of the funds raised for highways (some $73.6 billion) came from federal and state highway-user related taxes and tolls.[12] The $29 billion not covered by federal and local user fees came from local property taxes, general funds, and other indirect sources. Over 90 percent of these non-driver funds are raised at the state and local level. *(See Table 1.)*

ROADWAY CAPITAL OUTLAYS

The costs of road construction, improvement, and repair in 1989 were $33.3 billion. They were covered by a combination of gas taxes, other user fees, and non-driver sources. Gas taxes and other user fees, raised directly from drivers, constitute around 60 percent of the total sum raised, about $20 billion. Other sources, mostly at the state and local levels, paid the remaining $13 billion.

In 1989, about 265,000 miles of pavement were rated in poor condition and about 134,000 bridges were rated as structurally deficient.[13] Damaged roadways and bridges impose costs on drivers—vibration, noise, discomfort, and wear and tear on vehicles. These costs translate into higher motor vehicle repair costs, time lost, and inconvenience. According to Ketcham, 95 percent of all highway damages are attributable to heavy trucks.[14] Researchers at the Brookings Institution recently reached the same conclusion: "For all practical purposes, structural damage to roads is caused by trucks and buses, not by cars."[15] (For perspective, there are ten times as many tractor trailers on the roads as commercial buses.) Using adjusted data from the FHWA 1982 Cost Allocation Study, Ketcham estimates that a 36-ton 5-axle tractor trailer causes $0.37 worth of damage for every mile that it travels on an urban interstate. A 50-ton, 4-axle truck—with an average of almost 75 percent more weight per axle—causes an estimated $6 per mile worth of damage to a rural arterial highway.[16] (Road damages increase dramatically as axle loads rise: a typical single axle 13-ton truck does over 1000 times as much structural damage as a car.[17]) Clearly, trucks aren't paying their fair share. Truck owners pay only 32 percent of national highway disbursements. The extremes are in New York, where they contribute as little as 16 percent,[18] and Arizona, where they account for about 42 percent of the state's total user-fee receipts.[19]

ROADWAY MAINTENANCE

Maintenance costs cover routine patching, bridge painting, snow and ice removal, pavement marking, litter removal, and the like. Currently, user fees (such as gasoline taxes) account for about $12 billion (60 percent) of the $20 billion spent annually on road maintenance. The remaining $8 billion is financed at the state and local levels by taxpayers, property owners, and others, not directly by drivers.

HIGHWAY SERVICES

Among the many economic benefits enjoyed by motorists are highway patrols; traffic management; parking enforcement; emergency responses to traffic accidents by fire-fighters, paramedics, and police; investigations of vehicle accidents and auto-theft; and routine street maintenance. Stanley Hart, a California civil engineer, has estimated what it costs Pasadena, California to provide vehicle-related services, including motorcycle patrols, details for auto theft, parking enforcement, accident aid, fighting garage fires, and various public works expenses, such as traffic and road engineering.[20] Hart also estimated how much of these costs motor-vehicle user fees cover. For fiscal

Table 1. Summary of National Highway Receipts and Disbursements (Billions of 1989 dollars)

Sources of Receipts		
User Fees, Federal	$14.1	(19%)
User Fees, State/Local	$30.2	(41%)
User Fees, Subtotal	$44.3	(60%)
Other Sources, Federal	$ 2.4	(3%)
Other Sources, State/Local	$26.9	(37%)
Other Sources, Subtotal	$29.3	(40%)
Total Receipts	$73.6	(100%)
Disbursements		
Construction and Repair	$33.3	
Maintenance	$19.7	
Other	$18.2	
Total	$71.2	

Source: "Highway Statistics, 1989" Federal Highway Administration, U.S. Department of Transportation, FHWA-PL-90-003, Table HF-10.

year 1982–1983, auto-related expenditures for Pasadena totaled $15.7 million, and drivers directly paid only 25 percent of the total. Hart calculated that an increase in the fuel tax of 21 cents per gallon would be needed to cover these costs and that a comparable tax would be needed to cover similar county expenditures. Extrapolating these results to the entire United States provides a crude estimate of national costs: the annual costs of highway services not currently covered by user fees, Hart estimates, total $68 billion (1989 dollars). *(See Table 2.)*

PARKING

Parking costs should be considered part of the normal costs of owning and operating a motor vehicle. Yet, parking is supplied free to many motorists, effectively subsidizing the use of cars and trucks. The obvious example is the suburban shopping mall: customers park free. People who drive to the mall pay the parking fees only indirectly through the prices of the services and goods sold. Shoppers who walk or take public transportation to malls are thus paying for parking spaces they do not use, much as

Table 2. Summary of Annual Market Costs Not Borne by Drivers (Billions of 1989 dollars)

	Costs Not Directly Borne by Drivers
Highway Construction and Repair	$ 13.3
Highway Maintenance	$ 7.9
Highway Services (Police, fire, etc.)	$ 68
Value of Free Parking	$ 85
Total	$174.2

Source: See text.

consumers who pay with cash subsidize those who use credit cards.

Most employers in the United States also provide free parking. Approximately 86 percent of the American workforce commutes to work by car,[21] and over 90 percent of all commuters park for free at work.[22] In all, close to 85 million Americans enjoy free parking space at work.

What is the dollar value of these unborne costs to commuters? Assuming a $1000 per year average national value for a parking space,[23] the nation's 85 million recipients of free parking enjoy an annual parking subsidy of about $85 billion in addition to the other parking subsidies described earlier. *(See Table 2.)* Of course, someone pays this $85 billion annual tab for parking, but it is not part of the cost of driving.

Someone pays the $85 billion annual tab for parking, but it is not the driver.

Employers offer free parking to workers partly because this fringe benefit is not taxed federally. In the Washington, D.C. area, for instance, an employer can provide a parking space as a fringe benefit for an employee at a cost of about $8 per day, about $2000 per year, without the recipient paying any federal tax on the benefit. To provide the same employee with an extra $2000 of take-home salary, an employer

would have to spend about $4,400 per year (including federal, state, and local taxes, pension contributions and other benefits). More generally, Donald Shoup and Richard Willson have estimated that the value of a $1 tax-free parking subsidy—taking into account federal, state, and social security taxes—varies from $1.35 to $1.53, depending on the driver's taxable income. It thus costs employers far less to offer "free" parking—an untaxed benefit—than the equivalent salary increase.

An extensive literature on parking practices indicates that free or subsidized parking for commuters makes solo commuting almost irresistible.[24] *(See Figure 4.)* This commuting pattern, in turn, gives rise to excessive congestion, air pollution, security risks, accidents, and the various other societal costs outlined here. Shoup and Willson estimate that simply ending employer-paid parking would reduce the number of solo commuters between 18 and 81 percent, depending on local circumstances and transportation alternatives, and it would cut the number of cars driven to work by 15 to 28 percent.[25]

Where commuter parking is provided free, part of the cost is paid by taxpayers in general through

BOX 2. TWO ALTERNATIVES TO PROVIDE AN EMPLOYEE WITH AN ANNUAL $2000 BENEFIT

1. As a Paid Parking Place
   - Employee Benefit @ $177 per month: $2000

   TOTAL COST TO EMPLOYER $2000

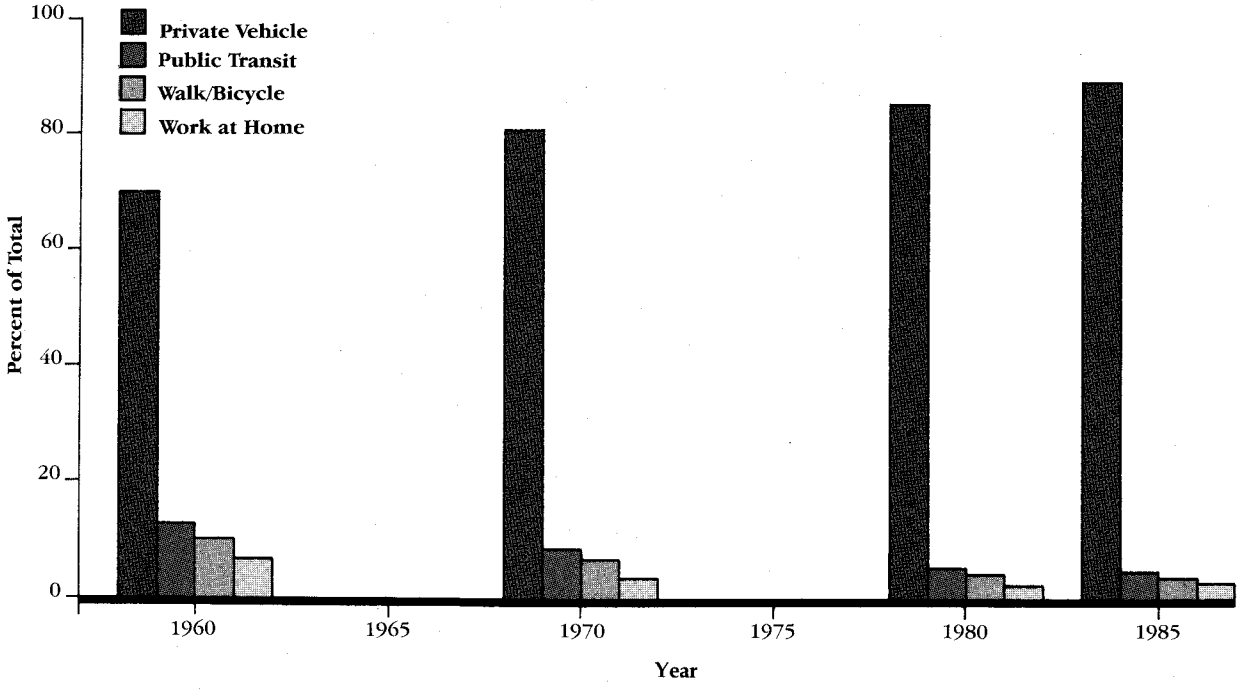
2. As a Salary Increase

• Employee Take Home Pay:	$2000
—Federal Tax @ 28%	1067
—State, Local Tax @ 7%	267
—Social Security @ 7.5%	286
—Pension @ 5%	190
Gross Salary	$3810
• Other Employer Contributions	
—Social Security @ 7.5%	286
—Workman's Compensation & Unemployment Ins. @ 3%	114
—Pension & Life Ins. @ 5%	190

TOTAL COST TO EMPLOYER $4400

Source: "Commuter Parking Cost Study," Metropolitan Washington Council of Governments, 1991, p. 19

Figure 4. Commuting Trends



forgone tax revenues, and part is paid by employers on behalf of their employees. Of course, employees indirectly pay some of this cost: if they weren't getting free parking, they would probably be getting some other form of compensation. Although employers and even the general public may benefit from free or subsidized parking—employee morale or punctuality might be better, for instance—the current allocation system masks the true cost of commuting. Many employees welcome free parking benefits, but others who live near work or prefer other modes of transport might not need or want free parking.

When parking is offered as a "take-it-or-leave-it" benefit, drivers have no incentive to change ingrained behavior. Without doubt, free parking encourages solo driving, and far more Americans drive to work alone than would if they had to pay parking costs directly.

V. EXTERNAL COSTS: PAYING THE BILL FOR CLEANING THE AIR, ENHANCING SECURITY, AVOIDING CLIMATE CHANGE, REDUCING CONGESTION, AND MITIGATING ACCIDENTS

THE COSTS OF AIR POLLUTION

After almost twenty-five years of efforts to reduce pollution from motor vehicles, the U.S. car and truck fleet is still a major source of carbon monoxide and smog. *(See Figure 5.)* In 1986–1988, about 112 million Americans were living in areas where at least one air quality standard was not met, in large measure the consequence of car and truck emissions. In developing and industrialized countries alike, air pollution problems are mounting, with motor vehicles the source of major carbon monoxide emissions and smog problems.[26] Although cars are getting cleaner with each model year, they are also getting more numerous and logging more miles—two trends that offset much of this improvement.

Although cars are getting cleaner with each model year, they are also getting more numerous and logging more miles—two trends that offset much of the improvement.

According to a 1991 report by the National Academy of Sciences (NAS), EPA has greatly underestimated the impacts of motor vehicles on smog levels. Emissions of smog-contributing organic compounds are probably two to four times greater than EPA estimates.[27] According to the NAS, the vehicles that EPA uses to calculate pollution emissions are cleaner than most of those on the road, corrections for speeding and evaporative emissions are inaccurate, the Federal Test Procedure does not accurately simulate actual driving, and current inspection and maintenance (I&M) programs are not leading to the reductions anticipated. As a result, tailpipe emissions from individual new cars and trucks have been reduced (and vehicle prices now include the cost of pollution control devices), but the motor-vehicle fleet emits much more pollution than previously thought—certainly too much to disregard.

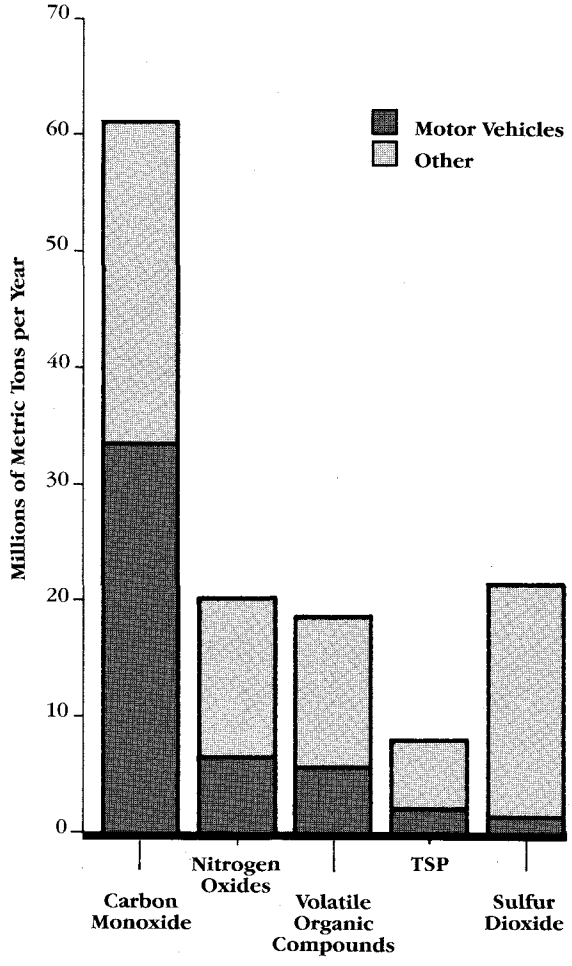
Motor vehicle pollution damages human health, materials, crops, trees and other vegetation, and visibility. Perhaps less obviously, the production, refining, transportation, and storage of oil also pollute the air and water, whether through oil spills or groundwater contamination.

Using EPA data, Mark French of the Federal Reserve System estimates the costs of motor-vehicle generated ozone reflected in health effects, lost labor hours, and reduced agricultural revenues at 3.5 to 11 cents per gallon with a point estimate of 6 cents (all 1987 dollars).[28] (These estimates exclude the costs of acid rain, chronic health problems, carbon monoxide health impacts, and forest damages from low-altitude ozone—all attributable at least in part to motor vehicle emissions.) Updating these values to 1989 yields estimated damages of $9 billion per year (with a range of $5 billion to $16 billion). The Congressional Office of Technology Assessment estimates the economic health benefits of meeting the ozone standard at $0.5 to $4 billion per year.[29] Much of this ozone forms in an atmospheric soup of motor vehicle emissions.

Researchers at the University of California, Davis, have also estimated the damages from motor-vehicle air pollution, including illnesses and premature death, reduced agricultural productivity, damage to materials, reduced visibility, and others.[30] They calculated damages amounting to $10–$200 billion per year, the large range reflecting the uncertainty surrounding the number of deaths and illnesses attributable to pollution and the monetary value assigned to human health and life itself.

Great uncertainties notwithstanding, the economic costs of motor vehicle air pollution no doubt run into billions of dollars per year. In this analysis, $10 billion, as a conservative estimate, is used. *(See Table 3.)*

Figure 5. Motor Vehicle Contribution to U.S. Air Pollution Emissions (1989)



Source: U.S. Environmental Protection Agency

THE RISING RISKS OF CLIMATE CHANGE

U.S. motor vehicles are also a driving force in global climate change. Reducing the risks will require changing energy-use patterns: about half of global greenhouse gas emissions stem from fossil fuel combustion (carbon dioxide), and the United States relies on fossil fuels for nearly 90 percent of its energy supply.

Greenhouse warming occurs when a blanket of atmospheric gases allows sunlight to penetrate to the earth, but partially traps the earth's radiated infrared heat. Over the past century, human activities have led to the buildup in the atmosphere of carbon dioxide and other gases (including methane, nitrous oxide, and ozone) that threaten to intensify this

Table 3. Annual External Costs Not Borne by Drivers ($ Billions)

Health Costs from Air Pollution	$ 10
Reduction (20%) of National CO_2 Emissions (Motor Vehicles Only)	>>$ 27
Security Costs	
Strategic Petroleum Reserve	$ 0.3
Military Expenditures	$ 25
Accidents	$ 55
Noise Costs	$ 9
Total	$126.3

Source: See text.

natural warming.[31] To stabilize atmospheric carbon dioxide concentration, the nations of the world will have to cut carbon dioxide emissions—the bulk of which arise from fossil fuel burning—by fully 60 to 80 percent.[32]

Given large scientific uncertainties, it is not possible to accurately estimate the actual costs of the current buildup of greenhouse gases. Looking for at least an imperfect substitute for reliable estimates of economic damages, some policy analysts have estimated the costs of reducing the threat by, for example, imposing a carbon tax or by planting trees to offset carbon dioxide emissions.* Dale Jorgenson of Harvard and Peter Wilcoxen of the University of Texas have estimated that a phased-in tax on fossil fuels, reaching $60 (1990 dollars) per ton of carbon in the year 2020, would cut U.S. emissions to 80 percent of the 1990 level by 2005 and would hold them there indefinitely.[33] A lower carbon-reduction target would obviously lead to a lower cost per ton. Stabilizing carbon dioxide emissions at 1990 levels,

*The costs of implementing such control programs may bear little relation to the actual damages being incurred from global climate change. For example, some have argued that increased energy efficiency, at least in the United States, could largely offset the buildup of carbon dioxide in the atmosphere at very little cost. Yet, the costs of damages so avoided could amount to hundreds of billions of dollars.

BOX 3. SOME FUEL-RELATED SOCIAL COSTS OF MOTOR VEHICLES

• Air Pollution—mostly carbon monoxide and smog—have reached unhealthy levels in many major U.S. cities with motor vehicles the principal source. Motor vehicles are also important contributors to acid rain through their emissions of nitrogen oxides.

• Oil Imports—U.S. petroleum imports have increased to almost 45 percent of supply, primarily to support growing transportation demand. Between 1973 and 1990 oil consumption declined 44 percent in buildings, 9 percent in industry, and 64 percent in power generation. Only in transportation has oil consumption increased: by 21 percent over this period. Transportation (motor vehicles, planes, ships, etc.) now accounts for almost two thirds of U.S. oil consumption and oil imports threaten our national and economic security.

• Global Change—Emissions of transportation-related gases contribute directly or indirectly to global warming and ozone depletion. These gases include carbon dioxide, CFCs, hydrocarbons, nitrogen oxides, and carbon monoxide.

for example, might cost as little as $17 per ton, according to the same study.**

In the United States, motor vehicles, planes, trains, ships, and pipelines account for about 30 percent of all carbon dioxide emissions. In 1990, motor vehicles in the United States consumed about 133 billion gallons of gasoline and diesel fuel, releasing about 350 million tons of carbon in the process.[34] *(See Figure 6.)* A $60-tax on a ton of carbon translates into a price increase of $8.20 per barrel of oil, or about $0.20 a gallon. Such a tax would significantly cut the use of coal—the fossil fuel with by far the highest carbon content—but would affect U.S. oil and gas consumption comparatively little.[35] Assuming that motor-vehicle fuel consumption would continue at roughly 1990 levels, a phased-in tax of $0.20 per gallon would eventually cost motorists about $27 billion per year. *(See Table 3.)*

**A worldwide 20 percent cut in carbon dioxide emissions would be only a first step to neutralizing the threat of global warming; it would *not* stabilize the concentration of carbon dioxide in the atmosphere. As already indicated, stabilizing carbon dioxide concentrations at today's levels would require an immediate reduction in global carbon dioxide emissions by 60 to 80 percent.

BOX 4. OTHER SOCIAL COSTS OF MOTOR VEHICLES

• Congestion—Traffic in major urban areas has steadily increased with the growth in urban sprawl leading to traffic delays, stress, lost productivity, higher vehicle operating costs, excess fuel use, greenhouse gas emissions, and air pollution.

• Accidents—Traffic accidents lead to pain and suffering, higher insurance costs, damages to vehicles and other property, extra legal, medical and emergency-services costs, and losses of productivity.

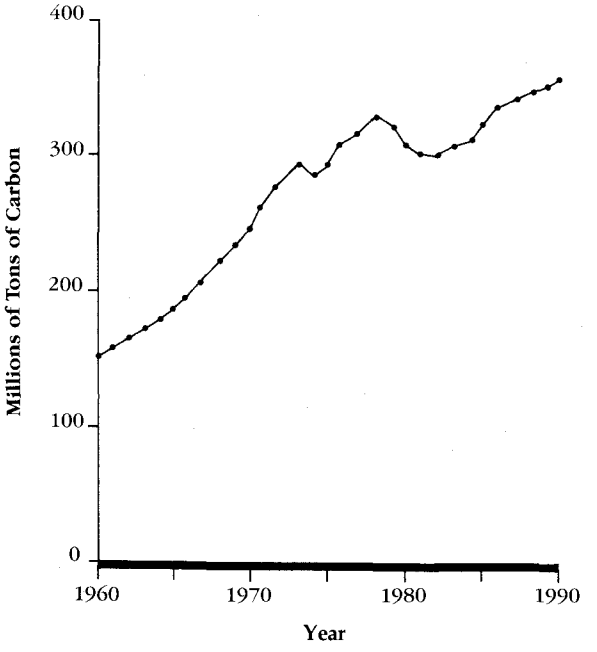
• Noise—In addition to causing ill health effects, noise from highways leads to reductions in property values.

• Land Loss—Over 2 percent of U.S. land is paved over for roads and parking lots. The building of roads and other transportation-related facilities has caused the loss of wetlands, watershed regions, aquifer recharge areas, parklands, scenic areas, and historic and cultural areas.

SECURITY COSTS OF IMPORTING OIL

Motor vehicles now account for over half of U.S. oil consumption and more than total domestic production. The U.S. transportation system is almost totally dependent on oil, ever more of it imported. This growing dependence puts the country's national security and economic well-being at risk. While the United States has been a net importer of oil since 1948, concern over the security implications of importing petroleum rose dramatically as the OPEC cartel's power grew in the early 1970s. At the time of the Arab oil boycott during the 1973 Middle East war, imports to the United States from the Persian Gulf accounted for about 5 percent of oil supply.[36] *(See Figure 7.)* After the 1979 Iranian revolution, Persian Gulf imports dropped, reaching a low of 3

Figure 6. Annual Carbon Dioxide Emissions From U.S. Motor Vehicles

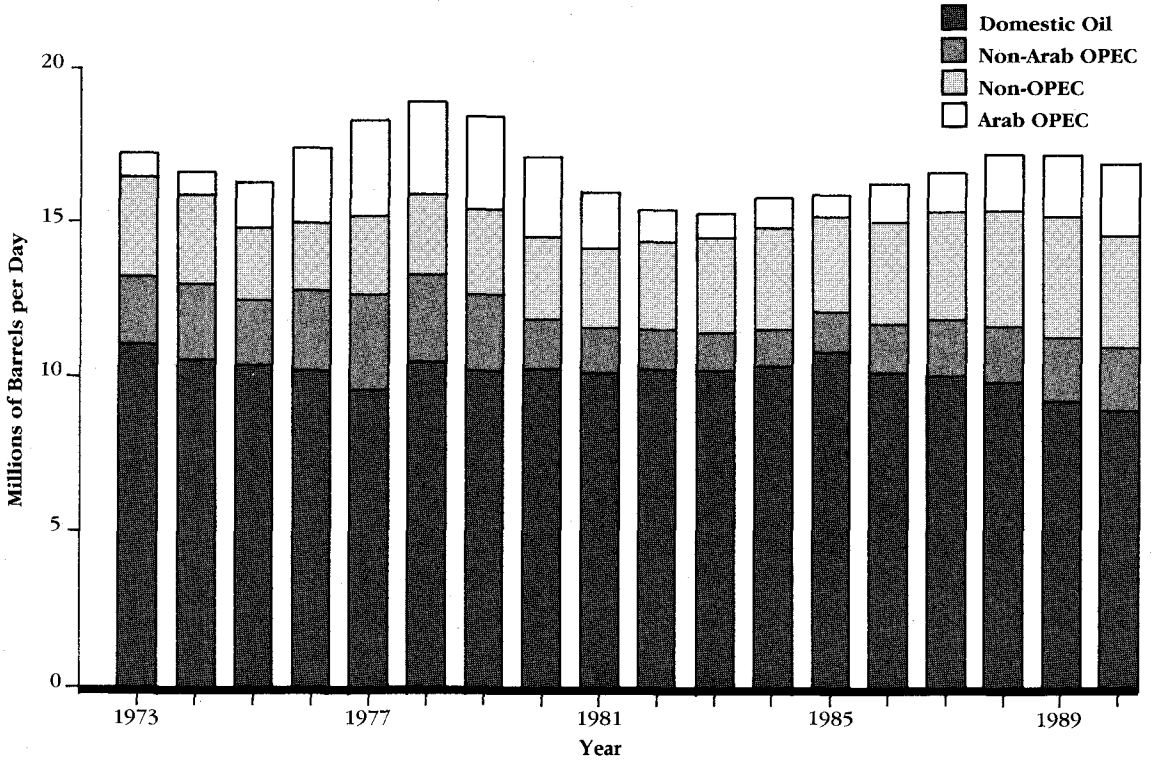


Source: WRI and U.S. DOT

percent of supply in 1985. With the crash in world oil prices in the mid-1980s, U.S. oil demand rose even as U.S. exploration and production efforts fell. The net result was yet another rise in imports from the Middle East to 13 percent of domestic supply in 1990. This trend is likely to continue. According to the Department of Energy, oil imports accounted for 42 percent of supply in 1990 and could reach 70 percent by the year 2010 and 80 percent by 2030.[37] With the expected decline in non-OPEC production,[38] oil-consuming nations everywhere will become increasingly dependent on oil from the Persian Gulf.

Dependence on imported oil, particularly from a politically unstable region, can impose several kinds of costs on U.S. society. The first is related to the potential impacts that increasing imports could have on the international price of oil. As the level of oil imported by the United States rises, global demand for oil increases, and worldwide oil prices are driven upward. This upward pressure can lead to higher oil bills for all oil-consuming nations and may increase inflation worldwide and decrease U.S. purchasing power globally. Over the last 15 years, various

Figure 7. Trends in U.S. Oil Supply



Source: WRI and U.S. DOE

analysts have estimated the economic costs of this element of oil import dependency at $0 to $100 per barrel of oil. More recent theoretical and empirical analyses suggest that this first class of social costs may not be as significant an economic threat as once thought.[39] In this report, the impact of U.S. demand for oil on world prices is considered negligible ($0 as a cost element.)

The second class of social costs arises from overall U.S. dependence on oil and our economic vulnerability to sudden interruptions of supply. Such costs could include inflation, inconvenience, loss of income, unemployment, and productivity declines, to name a few. Because of the international nature of oil markets, domestic economic disruptions in the United States can occur even if oil imports account for only a small fraction of total supply. The United States and other nations that rely heavily on petroleum for transportation and lack alternative fuels for cars and trucks are especially vulnerable to disruptions in oil supplies. But though such costs are real, experts don't agree on their actual dollar value.

Without reliable estimates of these costs (a problem with climate change too), analysts use the costs of mitigation programs as an approximation of the overall risks. Several types of government programs have been designed wholly or partly to reduce the risks of an oil-supply disruption or the economic impacts should one occur. Besides the research and development of alternative motor-vehicle fuels, the federal government has developed a strategic petroleum reserve (SPR) and maintains a military presence in the Persian Gulf to ensure access to Middle East oil—both actions to protect the U.S. economy from the costs of oil supply disruptions. In all, some $28 billion (1990 dollars) has been invested in the SPR since 1976, and appropriations for facilities and oil have been averaging about $500 million per year. Those who consume oil should bear these costs, not taxpayers (who pick up the tab for the Department of Energy). Even more significant are the costs of maintaining a sizable military presence to protect the Middle East region, estimated recently by Earl Ravenal for the Cato Institute at $50 billion per year.[40] This sum reflects the costs of supporting the so-called Central Command (CENTCOM); it covers the expenses of maintaining four land divisions, nine tactical air wings, and three navy aircraft-carrier battle groups; it does not include the costs, estimated at $5 billion per year, of a conventional war. Currently, the public pays these military expenditures through general tax revenues.

For several reasons, U.S. oil consumers should not have to foot the entire bill for these annual military expenditures. First, protecting access to oil may not be the only reason for keeping a military presence in the Middle East. Second, even if the United States significantly reduced its own oil imports, it might still feel a need to protect world oil supplies. All oil-importing nations, including the Europeans and the Japanese, benefit when the United States safeguards access to Middle Eastern oil supplies, a fact not lost on the countries that pitched in to pay for the war with Iraq in 1991.

Unfortunately, determining how much of these costs U.S. oil consumers should rightly pay is fraught with difficulties. Since motor vehicles account for half of U.S. oil consumption, in this report we allocate half the entire amount—$50.5 billion (SPR and military expenditures). *(See Table 3.)* We recognize that this estimate may be high and further analysis may produce a more appropriate value.

CONGESTION

Congestion is one of the most troublesome long-term problems facing transportation planners and one of the most frequently cited issues in the transportation planning debate. Although nearly everyone intuitively recognizes highway congestion by the obvious symptoms—slow or stop-and-go traffic, crowded lanes, gridlock—a technical definition of the condition is surprisingly hard to pin down. The Institute of Transportation Engineers describes "congestion" as what happens when the number of vehicles attempting to use a roadway at a given time exceeds the roadway's ability to carry the load at generally acceptable service levels. As conditions move from the various levels of service (summarized in Table 4), a highway becomes progressively more congested.[41]

In Los Angeles, congestion has already reduced average freeway speeds to less than 31 MPH; by the year 2010, they are projected to fall to 11 MPH.[42] According to the Federal Highway Administration (FHWA), congestion is serious and rapidly worsening elsewhere too. On interstate and other major roads, congestion caused an estimated 8 billion hours of

Table 4. Measures of Highway Traffic Flow (Design Speed of 70 mph)

Level of Service	Density[1]	Speed[2]	MSF[3]	V/C[4]	ADT[5]	DVMT[6]
A	12	60	700	0.35	–	–
B	20	57	1100	0.54	13,000	11,500
C	30	54	1550	0.77	15,000	13,000
D	42	46	1850	0.93	17,000	15,000
E	67	30	2000	1.00	18,500	17,000
F	Highly Variable and Unstable Conditions					

Source: GAO, "Traffic Congestion: Trends, Measures, and Effects" GAO/PEMD-90-1, November 1989, p. 39

1. Measured in cars per mile per lane
2. Average speed in miles per hour
3. Maximum Service Flow rate, measured in cars per hour per lane
4. The ratio of traffic Volume to Capacity
5. Average Daily Traffic volume per lane
6. Daily Vehicle Miles of Travel per mile per lane

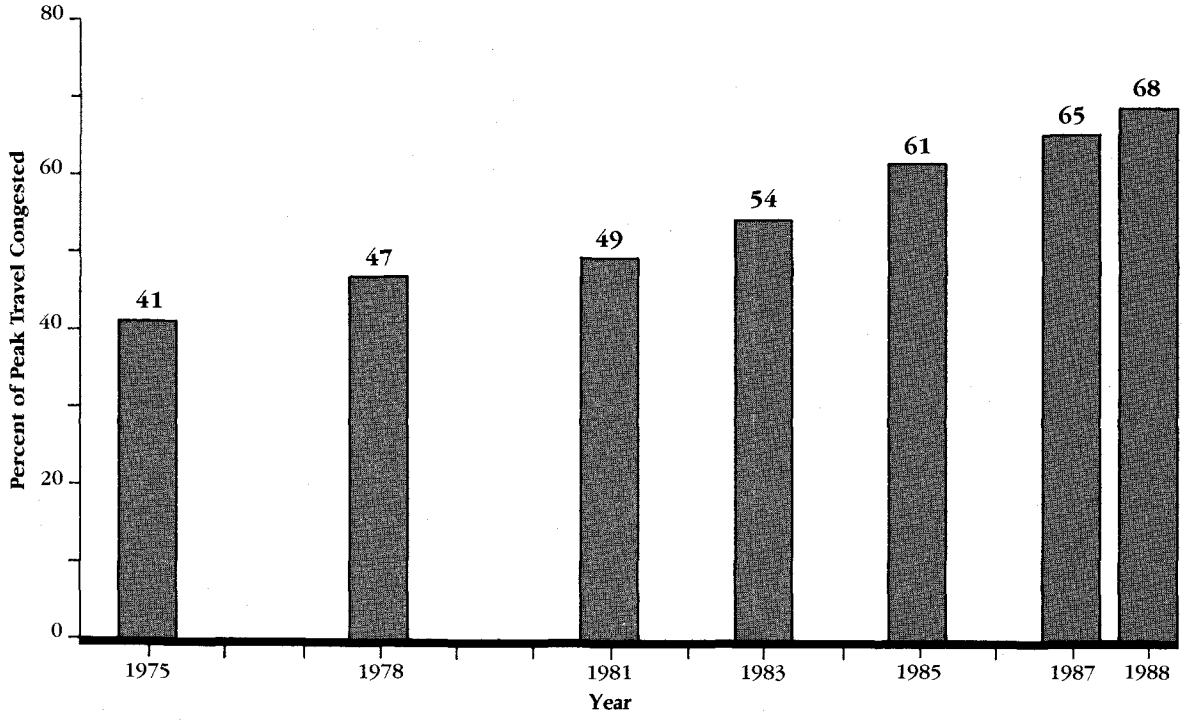
delay in 1989, lowering productivity and raising the costs of shipping freight by truck.[43] Almost 70 percent of daily peak-hour travel on the urban interstate system occurs under near stop-and-go conditions, a 30-percent increase since 1983.[44] *(See Figure 8.)* "Congestion now affects more areas, more often, for longer periods, and with more impacts on highway users and the economy than at any time in the nation's history," according to the FHWA.[45]

Congestion intensifies environmental problems, increases commuting times, raises vehicle operating costs (wasted fuel, excess wear on brakes, tires, and the engine, etc.), lowers worker productivity (from stress and fatigue), boosts insurance costs by increasing the risk of accidents, engenders productivity losses, and slows the delivery of business products. Though difficult to estimate, the toll of congestion on the health and mental well-being of drivers is also very real. Congestion is believed to increase blood pressure, frustration, and aggressive driving habits, even as it saps drivers' patience.[46]

Environmental and air pollution impacts only add to this catalog of risks and ills. Greater smog, higher acid rain levels, and growing greenhouse gas emissions are among the most menacing. Consider just the extra carbon dioxide emissions. According to Department of Transportation estimates, congestion caused the waste of 3 billion gallons of gasoline in 1984—3 percent of total national gasoline consumption. This waste resulted in the needless release of an extra 30 million tons of carbon dioxide in 1984. (The climate costs from these releases are included in the earlier cost estimates of global climate change.) By 2005, over 7 billion gallons are projected to be wasted as a result of growing highway congestion—70 million tons of carbon dioxide needlessly released into the atmosphere.

Estimates of the economic costs of congestion vary, and none has been comprehensive. Most have focused on such easily quantified values as lost time, wasted fuel, and increased insurance premiums due to accidents, and most exclude such costs as vehicle wear due to constant braking, driver stress, and other comparatively elusive damages. One widely cited report by the Texas Transportation Institute (TTI) found that congestion costs (from delay, extra fuel consumption, and higher insurance premiums) on major freeways and arterial roads in just 39 of the nation's largest metropolitan areas totaled over $41 billion in 1987.[47] Of this amount, $28.6 billion was for lost time, $4.3 billion for wasted fuel, and $8.1 billion for higher insurance premiums. The General Accounting Office cites estimates of national productivity losses from congestion of $100 billion

Figure 8. Travel Congestion on Urban Interstates



Source: Federal Highway Administration

annually,[48] and cites estimates of truck-delay costs from congestion of $24 to $40 billion per year.[49]

The total market costs of congestion on the nation's roadways total at least $100 billion per year.

Counting only productivity losses, excess fuel use, and higher insurance premiums, the total market costs of congestion on the nation's roadways total at least $100 billion per year. Drivers on congested roads bear this burden. (Externalities related to congestion—air pollution, global warming, noise, and so forth—are covered elsewhere in this report.)

MOTOR VEHICLE ACCIDENTS

In 1988, 14.8 million accidents involving motor vehicles led to 47,000 deaths and almost 5 million injuries.[50] Most of the costs of these accidents were borne directly by drivers. Approximately 17 percent of these motor-vehicle deaths, however, were among pedestrians and bicyclists.[51] Although cyclists and walkers both use streets and roads, neither group contributes much to the overall costs of roadway construction or maintenance. In this analysis, they are not considered roadway users, and a fraction of the total costs of accidents is allocated to them as non-drivers, at least in such categories as pain and suffering.

According to a recent study completed by the Urban Institute for the Federal Highway Administration, the total social costs resulting from motor-vehicle accidents amounted to $358 billion in 1988.[52] *(See Table 5.)* By far the largest cost category was pain, suffering, and lost quality of life—a total of $228 billion, estimated on the basis of the willingness of accident victims to pay to reduce the risks of such effects. The remaining $130 billion in losses was spread over productivity losses, property damage, medical expenses, legal and court costs, administrative costs, workplace costs, travel delay, and emergency services.

Who pays these costs? Some are borne by governments, some by insurance companies, some by

Table 5. Costs of Motor Vehicle Accidents (Billions of 1988 dollars)

	Total	Portion Not Directly Borne by Drivers
Wages & Household Prod.	58.1	13.1
Property Damage	38.3	0.0
Medical	12.6	2.7
Legal	7.9	0.0
Administrative	7.8	0.0
Workplace Costs	2.4	0.4
Travel Delay	2.0	0.0
Emergency Services	0.9	NA
Pain, Suffering, and Lost Quality of Life	228.5	39
Total	$358.5	$55.2

Source: "The Costs of Highway Crashes," prepared for the Federal Highway Administration by the Urban Institute. Pub. No. FHWA-RD-91-055, June 1991

NA: These costs are covered elsewhere.

businesses, and some by accident victims and their families.

■ Productivity losses amounted to $58.1 billion and included lost earnings from injury or death and lower productivity at home (when, for instance, the car is being repaired). Drivers paid most of this amount: roughly $23.8 billion was covered by insurance policies, mostly through auto insurance paid for by drivers; about $25.4 billion was borne primarily by those involved in the accidents. Federal and state governments picked up the remaining $8.8 billion. By our estimates, the total productivity losses not borne by drivers amounted to the $8.8 billion paid by federal and state governments and $4.3 billion (17 percent of the costs of all accidents) borne by pedestrians and bicyclists, for a total of $13.1 billion.

■ Property damages in 1988 amounted to $38.3 billion. Of this sum, $24.9 billion was covered by auto insurance (and therefore by drivers) and $13.4 billion by those in the accidents, also drivers. If it is assumed that pedestrians' and cyclists' property losses are negligible, then all property damage costs are being borne by drivers.

■ Medical expenses totaled $12.6 billion in 1988. Auto insurance paid by motor vehicle drivers covered roughly $2.2 billion of these costs. Another $6.5 billion came from health insurance and workers compensation. (Here again, we assume that 17 percent of these costs were paid by the policies of pedestrians and bikers.) State and federal governments and other sources (including charity care by hospitals) accounted for $1.1 billion; costs borne directly by those involved with the accidents, about $2 billion; and other sources paid the remaining $0.8 billion. Thus, the medical bill not directly borne by drivers totaled about $2.7 billion.

■ Legal, court, and administrative costs ($15.7 billion) were essentially all covered by auto insurance, so drivers paid them.

■ Workplace costs included lost time from workers talking about accidents or caring for victims, as well as recruitment and training costs to replace injured workers. Such costs amounted to $2.4 billion, of which 17 percent ($0.41 billion) are assumed not to have been borne by drivers.

■ Travel delays from accidents are estimated at $2 billion per year. Motor-vehicle drivers pay these costs.

■ Emergency services for accidents ($0.9 billion) are covered entirely by governments. (To avoid double counting with earlier cost estimates made under the highway services category, these costs are excluded here.)

■ The costs of pain, suffering, and lost quality of life ($228 billion) fall almost entirely to accident victims and their families. Again, the assumption here is that 17 percent, or $39 billion, was borne by pedestrians and cyclists. The total cost of accidents not borne by drivers comes to approximately $55 billion. *(See Table 3.)*

THE COSTS OF NOISE

Noise is often overlooked as a side effect of motor vehicle use, even though it bothers people living or working near roads and highways and causes stress and fatigue. Often, noise barriers—the costs of which are accounted for in highway-construction budgets—are erected between roads and homes or businesses. But roads can't be totally soundproofed—witness property value losses near roads throughout the country. By one estimate, even after mitigation,

traffic noise was reducing home property values by $6 to $182 per decibel.[53] By another, that of Douglass Lee of the DOT, the average cost of noise pollution to housing units is $21 (1981 dollars) per housing unit per year for each excess decibel of noise.[54]

University of Iowa researcher Barry Hokanson developed noise cost factors for both cars and trucks on urban highways.[55] Using updated values for these factors and 1989 figures for total vehicle-miles-traveled (VMT) in urban areas, in this report we have estimated noise damages to property in urban areas from cars and trucks at about $9 billion (1989 dollars) per year. Trucks cause about 85 percent of this damage. Researcher Brian Ketcham obtains essentially the same result, ascribing almost two thirds of the road damages to heavy trucks.[56] *(See Table 3.)* Motor-vehicle users are not directly footing these costs.

DAMAGES FROM VIBRATION

Like noise, vibration in homes and businesses along highway rights-of-way and the damages it causes are rarely acknowledged as a side effect of motor vehicle driving. Yet, when heavy vehicles hit potholes, they can shake and damage nearby buildings (as well as underground pipes), the repair costs of which fall upon the building owner or, in the case of large mains, municipalities or utilities. For the people who live in such buildings, vibrations can also cause stress and fatigue.

Not much statistical information on vibration costs due to motor vehicles has been published. But Ketcham has made a very rough estimate. Assuming the cost of vibration damage to be one half of the structural maintenance costs for buildings in urban areas, he calculates the national loss in property value (mostly along local streets) due to vibration to be about $6.6 billion for 1989. By his reckoning, heavy vehicles are responsible for most of this damage.[57] (Since no data are available by which to judge this estimate, we do not include it in our tabulation of costs.)

LAND LOSS

Not all land used for roads has a highly valuable alternative use, but construction of highways, interchanges, and other transportation facilities has caused the loss of wetlands, watershed regions, aquifer recharge areas, parklands, scenic areas, and historic and cultural areas. By some estimates, nearly half the land in a typical American city is used to accommodate motor vehicles.[58] More than 60,000 square miles of U.S. land is paved over—2 percent of total surface area and the equivalent of 10 percent of all arable land.[59] The costs of land loss are partially reflected in the costs of land bought for roads, though the true social costs would also include the full environmental or historical values, which have not been estimated.

VI. THE ROAD FROM HERE: SUMMARY AND RECOMMENDATIONS

Although exact calculations are subject to any number of qualifications and uncertainties, U.S. motor vehicles almost certainly impose very large annual costs on the country, many of which drivers do not shoulder. Costs hidden until now include both market costs (those reflected in prices paid for specific services) and externalities (those that fall outside of normal market transactions). Summarized in Table 2, estimates of market costs not paid by drivers (including road construction and repair, highway services, and parking) amount to about $170 billion per year. Summarized in Table 3, the external costs—those stemming from pollution, climate risks, a military presence in the Middle East, oil storage costs, accidents, and noise—come to about $126 billion per year. Together, the market and external costs of motor vehicle use that are not reflected directly in user charges to drivers amount to almost $300 billion per year, more than 5 percent of the country's Gross Domestic Product. Clearly, how these costs are paid will influence how much we use motor vehicles and, in turn, what social, environmental, and security problems stem from vehicle use.

Together, the market and external costs of motor vehicle use that are not reflected directly in user charges to drivers amount to almost $300 billion per year, more than 5 percent of the country's Gross Domestic Product.

It's only fair that those who enjoy the benefits of motor vehicle use should pay for the costs of that use directly. But there is no single best mechanism for charging all the now-hidden costs of driving to users of motor vehicles. Ideally, the price would be paid as close to the place and time where the cost is incurred as possible. In practice, this pay-as-you-go approach is not always technically or economically feasible. As an alternative, some of these costs (those related to fuel consumption or miles driven by a car) might most easily be included in existing federal and state gasoline taxes. Others might be more reasonably and usefully incorporated into user fees or insurance premiums.

Some pricing options, however theoretically attractive, may simply be too expensive or difficult to implement.

Such user charges could be further refined, considering that not all users of roads cause the same amount of damage to the transportation infrastructure, health, buildings, or the environment. If the "polluter pays" principle applied to environmental problems is invoked, the heaviest users or worst offenders should bear the greatest burden. In the case of road repair, for instance, trucks should pay a higher charge than other motor vehicles, one based on axle weight and distance traveled. Of course, as noted earlier, the costs of assessing charges or fees to cover the costs of driving cannot be ignored: some pricing options, however theoretically attractive, may simply be too expensive or difficult to implement.

No attempt is made here to evaluate in detail all the possible policy options for establishing user charges that reflect the cost burdens of driving. But the measures highlighted below illustrate the range of potential policy responses.

INCREASED FUEL TAXES

Many of the general costs identified in this report—those stemming from air and water pollution, global warming, security risks, and accidents—are associated with gasoline and diesel fuel consumption. Some could be shifted to drivers by increasing

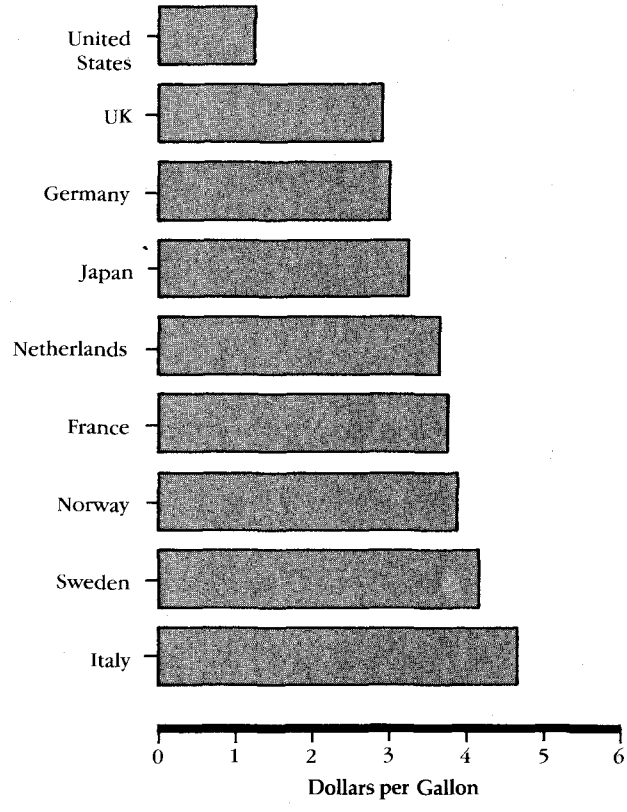
fuel taxes because total fuel-tax revenues increase directly with fuel consumption and thus at least partially reflect the risks associated with fossil fuel combustion in motor vehicles. A large fraction of other costs—including those of providing vehicle-related emergency police, fire, and medical services, and the costs of highway construction not now covered by user fees—could also be covered by fuel taxes, even though the rationale is weaker for paying these costs at the pump.

Even with a $2 per-gallon rise in the price of fuel—increased gradually over a decade to soften the blow—U.S. gasoline prices would still be below those of many other industrial nations.

The costs of automobile insurance could also be partially paid at the pump through an insurance premium levied on gasoline. The money collected would be placed in an insurance fund that would be used to help cover the costs of accidents. Proposals along these lines have been made in California. They have two clear advantages: they provide more complete accident coverage (reducing the problems posed by uninsured motorists), and they more closely reflect the actual risks that specific drivers face since motorists who drive more would pay higher premiums. If all of these fuel-related costs were added to the price of gasoline, fuel taxes would have to be increased over present levels by well over $2 per gallon. However, even with such a steep rise in the price of fuel—increased gradually over a decade to soften the blow—U.S. gasoline prices would still be below those of many other industrial nations. *(See Figure 9.)*

A common objection to higher fuel taxes is that they hurt low-income families, who spend proportionately more of their income on energy. But new analyses suggest that, for gasoline at least, the biggest tax burden won't fall on the poor.[60] MIT economist James Poterba argues that while the poor do spend a large fraction of their income on gasoline, overall household expenditures are a better index than

Figure 9. Comparison of Gasoline Prices (1990)



Source: International Energy Agency

income for measuring the regressiveness of higher gasoline taxes. According to Poterba, such benefits as food stamps, medicaid, and other programs give low-income families more purchasing muscle than their total income would suggest. If this hidden power is taken into account, he found, the poorest 10 percent of households spend less than 4 percent of their total outlays on gasoline—less than any other income bracket except for the very wealthy. "For the poor in inner cities who use public transportation," Poterba says, "a tax increase will yield higher income with little offsetting change in the cost of living."[61] The greatest burden falls on middle-income households. For this group, according to Poterba, between 4 and 6 percent of all household spending goes for gasoline.

Even so, it wouldn't be hard (administratively anyway) to take the sting out of higher gasoline taxes. For low- and middle-income families, income taxes could be cut to offset the burden. For those so poor that they pay no taxes, a refund could offset any losses. For retirees, social security benefits could be

increased to make up the difference. On balance, the overall change in taxes could be made progressive and still nudge consumers to reduce their fuel consumption.

For low- and middle-income families, income taxes could be cut to offset the burden of higher gasoline taxes. For those so poor that they pay no taxes, a refund could offset any losses. For retirees, social security benefits could be increased to make up the difference.

INCREASED TAXES ON TRUCKS

Since heavy trucks cause most of the damages to our roadways, they are responsible for the damages that cars and other vehicles suffer on deteriorating roads. The best way to cover these costs would be to impose an annual charge on trucks that would vary according to a vehicle's weight-per-axle and annual mileage—better indicators than fuel consumption of a vehicle's potential to destroy a road's surface.

PARKING AND TAX REFORM

The land-use and environmental problems caused by subsidies for commuter parking can be addressed through a variety of policies.[62] One would be to require employers who offer free parking to give all employees the option of taking a tax-free travel allowance of equal market value. A variant of this option would be to put a ceiling on the tax-free portion of the subsidy. Any such move should go hand in hand with the development of other policies affecting commuting, such as vanpooling incentives, free parking for bicycles, preferential parking for carpools, providing rides to public-transit nodes, guaranteed rides home to workers when emergencies arise, and so forth. At shopping malls, a more equitable way to supply parking would be to charge shoppers who drive for parking instead of hiding the cost in the prices of goods sold.

TOLLS AND TIME-OF-DAY PRICING OF ROADWAYS

Governments at various levels have long attempted to accommodate growth in motor vehicle use by building more roads instead of addressing the economic forces behind traffic growth and congestion. Gradually, highway construction replaced mobility as the paramount goal. The drive to build more roads may once have been appropriate, but today such a strategy is destined to fail: ample evidence shows that every time a roadway is built or widened, more drivers appear and the new or expanded roads soon become as congested as the old ones.[63]

Congestion on major urban roads takes a substantial economic and environmental toll on all Americans. Even if drivers bear most of these costs already, introducing congestion pricing would make drivers squarely face the costs they impose on others by driving when traffic is heavy. It would encourage them to reschedule or reroute trips, try alternative modes of travel, or carpool.

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The technology for rapidly scanning vehicles for billing purposes already exists. Electronic number plates have been successfully tested in Hong Kong.[64] Sensors in the road read each vehicle's code as it passes over the toll site and a monthly bill listing the charges is sent to each driver. Electronic license plate systems are already in use on the North Dallas Tollway and on the Coronado Bridge in San Diego. An alternative proposal would use prepaid "smart cards," available at gas stations, from which tolls would be deducted as the car crosses a metering point. Similar electronic billing technology is being tested on Interstate 190 near Buffalo, New York: a device reads special windshield tags and automatically deducts the toll from the driver's prepaid account.

According to a new World Resources Institute study recently summarized in Congressional testimony,

if congestion tolls were set just to reflect the costs of traffic delay, they would range (according to local conditions) from $0.25 to $1.25 for a typical ten-mile urban trip.[65] Time-of-day tolls represent an important step toward easing congestion and reducing such associated economic and environmental costs as wasted fuel, excessive air pollution, and carbon dioxide emissions.

Congestion can, of course, also be mitigated directly through various technological and traffic-management programs financed through user fees. The Institute of Transportation Engineers has evaluated many options for reducing congestion—HOV lanes, improved traffic signals, motorist information systems, reversible traffic lanes, ramp metering, parking management programs, and many others—on the basis of overall effectiveness, cost, and barriers to implementation.[66] No single solution, the authors found, is most effective against congestion problems in every region. Rather, each area of the country has to be evaluated separately and an integrated program developed to fit local conditions and satisfy local needs.

Unfortunately, no combination of technological fixes can prevent congestion permanently. As noted, adding or widening roads merely invites more motor vehicle use—a strategy that contains the seeds of its own failure. Another technological chimera is expanding infrastructure to increase average travel speeds to conserve fuel. Australian researchers Peter Newman and Jeffrey Kenworthy have shown that although energy use and emissions are both lowest at travel speeds of 45 mph, free-flowing uncongested traffic actually encourages more driving within a region or city, resulting in more aggregate emissions and energy consumption.[67] So-called smart highways may reduce congestion for a while, but over the long term they too will probably just attract more traffic by improving driving conditions.

REFORM OF ZONING AND LAND USE PLANNING

Over the longer term, technological fixes and user charges alone are unlikely to break up growing urban congestion. For that, a more efficient transportation system based on changes in land use and development patterns is needed. According to John Holtzclaw, a California planner and engineer, a doubling of residential population density is associated with a 25- to 30-percent reduction in the number of miles people need to travel by car.[68] European cities are living proof that a high standard of living is compatible with a reduced need for cars and that the key to both is fairly high residential densities combined with mixed zoning and integrated public transportation planning. Public transportation will never be viable in the United States if the ideal remains three or four dwellings per acre. Densities above 7 housing units per acre are needed for cost-effective bus service while densities of over 9 housing units per acre are needed for cost-effective light-rail service.[69] Similarly, by changing zoning to allow mixed residential and commercial development, the number of daily auto trips per household could be cut up to 25 percent.[70] The need for auto trips can also be reduced by rearranging our cities so they support not only public transit but bicycling and walking as well.

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The development of a balanced transportation system is likely to require a number of policy reforms, including gradually increased fuel taxes; changes in federal funding formulas to favor—or at least not to disadvantage—public transportation; the wider introduction of road tolls and other forms of highway pricing; technological fixes to reduce congestion; changes in tax policies that now encourage solo commuting; and the adoption of land-use and zoning reforms to encourage the denser urban development that is more compatible with walking, bicycling, and public transportation.

A few of these reforms were adopted in the newly enacted Intermodal Surface Transportation Efficiency Act of 1991. This landmark law authorized $151 billion for highway and public transit over the

following six years. Of this, $32 billion was specifically earmarked for mass transit—twice the previous annual spending and twice the amount recommended by President Bush. And—except for the completion of a small portion of the interstate system—for the first time, the same ratio of federal to local funding will apply to both highway and transit projects, removing the previous bias toward building roads. The Act broke new ground, giving states and local governments more leeway in how they spend federal funds. For example, states may transfer up to half of their National Highway System funds ($21 billion) to mass transit or other transportation projects. (States that aren't meeting federal clean air standards—in 1989, some 39 states—may shift all of their NHS funds to other projects.)

Yet, the new transportation bill fails to address the basic issues of making drivers pay the full costs of motor vehicle use—a key to developing a more efficient transportation future. The Administration and Congress have ignored the need to adopt higher fuel taxes and offset parking subsidies, for instance, and have neglected the potentially powerful roles that toll roads and road pricing could play in alleviating congestion. Without such reforms, the motivation needed to change driving and travel habits so that people will switch to more efficient transportation modes just isn't there.

James J. MacKenzie is a Senior Associate in WRI's Climate, Energy, and Pollution Program. **Roger C. Dower** is Director of WRI's Climate, Energy, and Pollution Program. **Donald D. T. Chen** holds a master's degree in Environmental Studies from the Yale School of Forestry and Environmental Studies.

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World Resources Institute

1709 New York Avenue, N.W.
Washington, D.C. 20006, U.S.A.

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