

Mating season, Amstelveld, Amsterdam, 1998
 While a car, as a sculptural object, may even be beautiful, cars bring only ugliness to city streets, as here at the Amstelveld. These two shapely automobiles blot this tree-lined square in the heart of Amsterdam's canal district. This is but a mild example of the harm cars do to urban environments.



WICKED CARS

By "urban automobile" I mean any mechanically-propelled private passenger car that is routinely driven at speeds above 30 km/hr.

See the bibliography for sources. The most up-to-date information is often to be found on the Internet, where most environmental organizations maintain useful sites.

There is a multitude of reasons to remove cars and trucks from our cities. While technology may eventually solve or at least ameliorate many of the problems with cars, some of the worst problems are inherent, and urban automobiles will always remain a serious nuisance at best. I believe that the real solution to these problems is to remove cars and trucks from our cities. This chapter has as its goal to persuade the reader that this is the most reasonable course of action.

The past few years have seen the beginnings of a serious dialog about the effects of cars and trucks on urban life. This reflects a dawning awareness following a century in which we blindly accepted the harm caused by motorized vehicles riding on rubber tires. While air pollution gained attention in the 1960s, many other problems related to automobility were not widely recognized until quite recently, and some are still not generally understood. We begin by reflecting on the war between cars and other street users.

CARS VS. PEOPLE

Cars are merely tools, and in rural areas they certainly have appropriate uses. In cities, however, life becomes a contest between cars (and their drivers) and everyone else. In most cities, of course, many people are also drivers, so many of us share in both the blame and the harm. Some of the problems discussed in this section apply primarily within cities, but the slaughter wrought by cars is a problem everywhere.

Slaughter

Practically everyone in the industrialized world knows someone who was killed or maimed in a road accident, and it seems that we have resigned ourselves to this carnage. Road traffic accidents are the leading cause of death worldwide among males aged 15-44. Traffic claims appalling numbers of children: some 300,000 die every year in road crashes around the world.

The USA is one of the safest countries in the world in terms of deaths per distance driven, but in 1998, despite safer cars and highways, US motor vehicle crashes caused almost precisely one death per 100 million vehicle-kilometers traveled, for a total of 41,471 lives lost. In 1994, car crashes were the ninth most common cause of death among all Americans.

By comparison, railroads, with their dedicated rights-of-way, passive guidance, trained operators, and automated safety enforcement, are perhaps the safest form of transport ever devised (airlines may be safer on a passenger-mile basis). Between 1894 and 1994, a total of 9678 people died in railway disasters worldwide, including 543 soldiers killed in the crash of a jam-packed World War I troop train (a wreck that peacetime operational procedures would have prevented).



Central Amsterdam, 1999

Amsterdam is known as the "Venice of the North" because of its canals, but unlike Venice, cars hurt the city's quality of life and besmirch its beauty.

"Global Burden of Disease," 1999, page 19

Archives of Diseases in Childhood, September 1999; 81:200-201

Pucher & Lefèvre, 26

"Traffic Safety Facts 1998," National Highway and Traffic Safety Administration (NHTSA), page ii

NHTSA, National Center for Statistics and Analysis, March 1998

Railroads operate on exclusive rights of way; conflicts with other traffic only arise at grade crossings.

The World Almanac and Book of Facts, 1995. While this is not a comparison of deaths per passenger-kilometer, it does give an indication of the relative safety of trains and cars.

This 100-year global toll is about equal to the number of Americans killed by car crashes in a three-month period.

Danger to Pedestrians and Bicyclists

While car drivers may be said to enter into an implicit agreement to risk life and limb in order to get somewhere in a hurry, many victims of hasty drivers are defenseless bicyclists and pedestrians who have no choice but to use the streets. Some of them never drive and so gain no benefit from the risks they must accept. Many victims are children and elderly people. In Britain, pedestrians represent a shocking one-third of all road deaths. London is notoriously dangerous for children and the elderly.

Out of My Way... Or Else

An enormous power imbalance exists between a pedestrian and a car driver. If anything goes wrong, the pedestrian is likely to be seriously injured or killed. The car driver is unlikely to suffer anything worse than a dent in his car. Nothing can rectify this fundamental injustice, and many drivers still act like schoolyard bullies when they encounter a pedestrian.

Dr. Jekyll and Mr. Hyde

When I used to drive, I noticed that I became a different person behind the wheel of a car, a person I didn't much like. Driving seems to have that effect on many people. It is otherwise hard to explain how so many people, who are polite and considerate in their usual dealings, become highly aggressive once behind the wheel of a car. Multiply this by millions, release the result onto the highways twice a day, and watch as shattered parents return home after a hard day's work and grueling commute. This does not help parents to be nice to their kids or to spend very much time with them.

"Federal data shows that 5,157 pedestrians were killed on the nation's streets in 1996. 69% of those fatalities occurred on neighborhood streets. 837 children died on the street in 1996, 16% of the total pedestrian deaths. This is a significant public health and safety problem that is killing more Americans than headline-grabbing causes of death such as accidental shootings, airbags, or the e-coli bacteria." Mean Streets '98: <http://www.transact.org/mean98/p2.htm>

Freund & Martin, 36

The extreme cases of this are known as "road rage"

WRECKING COMMUNITIES

Apart from the danger that cars impose on city streets, traffic also damages the social systems of almost every city. Traffic is a direct contributor to the breakdown of social systems in the USA, both in the inner cities and in the suburbs. In rural areas, cars do actually improve social systems, by making it easier for friends and neighbors to associate, but in cities with decent public transport, cars contribute little to the health of social systems while doing great damage. We consider in this section some of the ways in which cars harm society.

Destruction of Social Systems

The work of Donald Appleyard has established that as automobile traffic on a street increases, social life on that street dies. The noise, danger, and pollution slowly drive people off the street.

People will tolerate quite a lot before they finally abandon the street. In Madrid, for example, people still patronize sidewalk cafés despite the stink and roar of passing diesel trucks. That people will tolerate such conditions shows how highly they value the social functions of common public areas. When conditions finally become so bad that people are driven from the street, chance meetings between neighbors rarely occur, and they are more likely to remain strangers. This lack of contact does grave damage to the social fabric of the neighborhood.

On streets with really heavy traffic, people do not even inhabit the rooms that front on the street, and they make every effort to shut the street out of their lives. Traffic noise makes conversation difficult, even indoors. On streets with such heavy traffic, many people do not even know who their neighbors are.



Carfree street, Bologna, Italy, 1998

This street looks bald, for the simple reason that it isn't carfree at all: I waited for a break in traffic to take the picture. If it were carfree, the street would draw in people and activities.



Sidewalk café, Siena, Italy, 1998

Guests gaze out over the grand Campo, the Gaia fountain, and the campanile. Occasionally a car passes through the square along the far side, but usually all you hear is people talking.

By contrast, in Venice, people don't look over their shoulders, because they know nothing is bearing down on them. The streets are quiet, so there is no need to shout just to be heard. People relax and are more willing to talk to strangers, which leads to a comfortable feeling in the streets.

Isolation of Drivers

If you regard car drivers as gladiators wearing two tons of self-propelled armor, you gain a better understanding of the social dynamics of automobility. Drivers are not part of the landscape through which they pass. They gaze serenely upon the scene while being insulated and protected from it. Drivers thus have no investment in what happens outside their cars and little sense of responsibility. This insulation has permitted the American middle-class to tolerate appalling conditions in the inner cities. People on foot or bicycle or public transport are more aware of conditions around them, more likely to be affected by a bad environment, and hence more likely to take responsibility for maintaining and improving the areas in which they find themselves. This tends to make deteriorating social conditions self-correcting. Among the rich nations, only the USA has accepted the destruction of its inner cities, probably because no other nation depends on cars to quite the same degree.

Isolation of Non-Drivers

The automobile has isolated the young, the elderly, and anyone who does not drive, particularly in suburban areas lacking any other form of transport. Most suburban children grow up with a very narrow experience of the world and remain dependent on their parents for mobility until they reach driving age. This delays the development of their independence and self-reliance. It also delays their entrance into their community:

A healthy community is one where children can play outdoors on their own, and where they have the freedom to move around their neighbourhoods without fear. Children learn right from wrong by interacting

with others: friends and neighbours as well as family and teachers. Keeping children off the streets can only hinder their moral and social development. It stops them mixing socially with their neighbours and learning the importance of respect for others, and leads to them having less sense of responsibility for their actions. As for abductions by strangers, while they are tragic events, it is important to remember that they are very rare (which is why they get so much media attention). Home zones will reduce the risk of abduction, because there will be more people out and about in the street and more contact between residents. Family, friends and neighbours will all be keeping a watchful eye out.

Because the car often provides the only means of mobility, older people tend to keep driving long after their vision and reflexes are really up to the task. In most of the USA, giving up one's driver's license amounts to a de facto resignation from the community's social life. Those who can no longer drive are sometimes imprisoned by traffic, as in the case of the Tamiami Trail, which debouches into Port Charlotte, Florida, as a street 14 lanes wide at some intersections. Many old people live nearby, and, despite the traffic islands in the middle of the crosswalks, those who are frail cannot cross from the curb to the island during the interval that the light is with them: they can no longer cross this street *at all*.

Disturbing the Peace

In most cities, traffic is the worst source of noise, but in the pedestrian precincts of **Amsterdam** and **Copenhagen**, the loudest sounds are often **people's footsteps**. Venice is entirely free of automotive noise, and quiet usually reigns in carfree downtown areas in other cities. Once cars vanish, people



Nancy, France, 1997

This street is dangerous for kids to play on, and, with all those cars blocking the view, neighbors can't keep an eye out.

Quote courtesy the Children's Play Council
"Home Zones: Reclaiming Residential Streets,"
National Children's Bureau, London, 1997.

I once attended a meeting in a new office building located near a busy California highway. The building was sound insulated and had triple glazing. Throughout the meeting I was distracted by the peculiar whine of the attenuated traffic noise. Outdoors it was difficult to hold a conversation.

tend to speak more softly and life becomes more peaceful. Even worse than cars are motor scooters and motorcycles, many of which make simply shocking amounts of noise. No attempt at regulation has had any lasting success at quieting these miserable things.

Not in My Back Yard

In the developed nations, public opposition now makes it nearly impossible to build new urban highways. Societies that have lived with cars for a generation or more have a clear understanding of just how much damage a highway does to the quality of life. Nobody wants a highway running through the back yard: the noise alone is reason enough. Local opposition to the intrusion of a highway, and to the demolition of entire neighborhoods to make room for it, has become so vociferous that few cities even dare to propose such schemes. To skirt the conflict, governments instead build new ring roads, ever farther from downtown. This leads to still more sprawl, even worse highway congestion, and yet more damage to the economic vitality of the inner city, as jobs and housing are lured away by the ring road.

AUTOMOBILITY DOES NOT WORK

When the first cars were sold little more than a century ago, it was not foreseen that this curiosity would become the dominant transport mode in richer nations. Cars initially provided only entertainment and recreation; they had yet to become a serious means of getting about. Top speeds were low and breakdowns routine. As auto manufacturers solved these problems, people began to expect that cars would improve mobility, but better mobility is not provided by higher speed alone. Cars improve mobility in rural areas and



Highway interchange, Los Angeles, 1999

Nobody wants one of these in the backyard, or even anywhere near by.

Mobility can be defined simply as getting people where they need to be.

small towns, but in metropolitan areas, cars actually *reduce* mobility. It is crucial to understand why this occurs. It has to do with the astonishingly large amount of space consumed by roads and parking lots in auto-centric cities.

Cars Demand Too Much Space

A single traffic lane can carry only 2000 cars an hour under ideal circumstances. (A rail line can move up to 20 times as many people over the same amount of land, before any allowance is made for parking.) As more roads are built to carry increased traffic, less land is available for other uses, forcing development into rural areas far from downtown. The resulting sprawl increases the length of many trips, causing yet more demand for highway capacity. The results of this vicious circle can be seen in any large auto-centric city.

Cars can only provide fast transport if an extensive system of highways is constructed. This, however, requires the construction of interchanges where two major highways intersect. These interchanges sometimes have six levels of traffic crossing one another, and the space required for elevation and direction changes becomes enormous. These interchanges can take a decade to construct and cost hundreds of millions of dollars.

In addition to road space, each car also needs several parking spaces. (It seems that nobody really knows just how much parking is needed. The figure of eight spaces per car is often quoted, but the source of this number remains elusive.) Under ideal circumstances, just 400 cars can be parked at ground-level on one hectare. Multilevel parking garages can increase this value considerably, but garages are expensive to construct (and must be the ugliest structures ever made by man). Even multistory garages occupy large amounts of land.



Parking garage, Los Angeles, 1999

For a given amount of land, many more cars can be parked in a multilevel garage than on a simple, at-grade parking lot. The difference is not as great as it might seem, because the dual access ramps (one up, one down) consume much space.

Finally, there is the space required by the automobile infrastructure itself: car washes, service stations, tank farms, body shops, junk yards, and dealerships. To this we could add the space required by hospitals to treat those injured in wrecks.

Perpetual Traffic Congestion

Contemporary wisdom on roads and traffic holds: "build a road and they will come." New roads in urban areas are almost instantly filled to capacity and beyond. It seems that no matter how many roads we build, they will always be congested at rush hour. Since the demand for transport is finite (presumably, people want to spend some time at their destinations), there must exist some capacity at which demand is fully supplied, but building this much capacity is almost beyond contemplation. In fact, roads would expand to occupy most land in the city center.

Traffic engineers have recently concluded that the best way to relieve congestion is to *reduce* road capacity. This runs contrary to common sense, but it works, after a fashion. At first it was assumed that the traffic was merely being displaced to other routes, but it now appears that about 20% of the traffic simply disappears. What is happening, of course, is that some people are either not making the trip at all or going by another means. The difference between the number of trips people would like to make and the number of trips they actually do make is the "mobility gap." Clearly, traffic congestion now imposes mobility limitations on Americans, especially in the suburbs. Some activists want to limit mobility in order to reduce environmental damage. However, I see no reason to deny people the access to the social, cultural, educational, and employment opportunities that quick, convenient, sustainable transport can provide.

"Relationships Between Highway Capacity and Induced Vehicle Travel," Robert B. Noland, U.S. Environmental Protection Agency, 16 November 1998, paper no. 991069.

On any road, as traffic begins to thicken, speed diminishes, vehicle spacing shrinks, and more capacity becomes available at the slower speed. This appears to be a stable feedback condition. However, once speeds have fallen to the optimum level, any further increase in traffic results in snowballing delays, and traffic grinds to a halt. This condition now regularly occurs on streets and highways around the world.

Building new roads is no longer an option in many cities. The Century Freeway, the last major new superhighway built through central Los Angeles, cost a staggering \$200 million/kilometer.

Newman & Kenworthy, 60

The Limits of the Auto-Centric City

As more and more people move into an auto-centric city, the area covered by the road system increases without limit once the population reaches around five million. In order to keep all areas of the city within a 90-minute rush-hour drive, roads, parking, and other auto-related services must expand to cover all available ground. Some auto-centric cities in the American West and South are actually approaching this absurd condition: up to 70% of downtown land in Houston and Los Angeles is devoted to the automobile.

Beyond a certain point, however, the demand for more road capacity becomes practically impossible to meet, for the following reasons:

- The land area required by roads becomes enormous and exerts a further centrifugal effect.
- Air pollution caused by the large number of cars traveling long distances becomes an intractable problem.
- The cost of new highways becomes so high that their construction is not even considered.
- The energy costs of transport become insupportable.

Without rail transport, a growing metropolitan region will eventually occupy so much land that it becomes a constellation of contiguous cities. Los Angeles and Atlanta are vast agglomerations, more than 100 kilometers across. It is impractical to live at one extremity of Atlanta and work at the other extremity: these agglomerations no longer function as single, unified cities.

FOULING THE NEST

We are making a mess of the Earth. While cars are not the only culprits, they account for a large share of the damage we are doing. Aside from the problems of their direct emissions,

In Lancaster and Palmdale (on the fringes of Los Angeles), one-third of commuters drive more than 80 km to work.

"Shaping Cities: The Environmental and Human Dimensions," Marcia D. Lowe, Worldwatch Paper 105, page 19

Atlanta recently reached a crisis. Air pollution had become so bad that the US government threatened to withhold vital highway funds. In the 1998 elections, a new governor was elected on the promise of tackling the problem. His proposal for a regional body with broad powers over transport and development won wide support and was easily adopted in the state legislature.

Pollution emitted from typical USA work commutes, in grams per 100 passenger-km.

Mode	Organics (VOC)	NO _x
Metro	0.2	30
Bus	12	95
Single-occupancy car	130	128

"Alternatives to the Automobile: Transport for Livable Cities," Marcia D. Lowe Worldwatch Paper 98, page 14

While it is true that newer cars are cleaner per vehicle-mile traveled, total US highway emissions during the period 1960-1995 have increased 73% for NO_x and 1% for CO. Volatile organic compounds (VOC) did actually fall, by 41%. The increase in vehicle miles traveled is negating improvements in emissions control.

From a posting by John Holtzclaw of the Sierra Club to the cons-spst-sprawl-trans list

The combustion of hydrocarbons under pressure, as in an internal combustion engine, also generates a potent family of greenhouse gases, NO_x.

Solar sources include wind energy, hydropower, and biomass, as well as direct solar conversion devices such as solar cells and sun-fired steam generators.

cars also consume huge amounts of raw materials in their construction. The extraction and smelting of metal ores causes a great deal of pollution and consumes large amounts of energy, as does the production of plastic and glass. The disposal of junked cars and worn out parts (batteries in particular) also contributes to the burden. The transport and refining of petroleum further taxes the global ecosystem. When all these burdens are taken into account, the problem becomes large indeed.

Poisoning the Air

Air pollution problems are exacerbated in cities because of the extreme concentration of cars and trucks. Every large auto-centric city has been faced with horrific air pollution problems, and while vast resources have been committed to cleaning up automobile emissions, little progress has been made in improving air quality.

Global Warming

Cars are fueled, directly or indirectly, by fossil fuels, and therefore aggravate the global warming problem by their CO₂ emissions. Only electric cars recharged from nuclear or solar energy sources and vehicles burning renewable fuels do not contribute to global warming. Most energy today comes from carbon-based fuels (mainly coal, oil, and natural gas), and all of these emit CO₂ when burned. Energy derived from non-fossil sources is currently expensive and of limited supply, but both the cost and supply picture are improving.

Poisoning the Land & Water

Cars are not usually mentioned in connection with water pollution, but they are a source of two serious pollutants: oil and salt. Cars release more oil than tanker spills, and winter

road salt finds its way into drinking water. Cars also cause heavy-metal pollution. Lead is released in huge quantities because it is added to gasoline as an octane booster; leaded fuels are still used in many areas of the world. Even tiny amounts of lead inhibit the mental development of children.

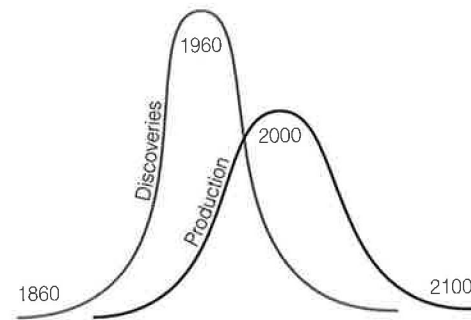
RESOURCE CONSUMPTION

The global automobile fleet now numbers about 500 million vehicles. In rich nations, every second person owns a car. If this rate of car ownership were extended to a global population of 6 billion then we would have 3 billion automobiles, or six times as many as now. Even if vehicle weights decline dramatically, our planet may not harbor enough natural resources to build and fuel this enormous fleet of automobiles.

The End of Cheap Oil

American oil geologist M. King Hubbert spent a lifetime considering the relationship between petroleum supplies and industrial economies. He paid particular attention to the question of the extent of supplies and was the first to warn that the oil age would be a short one. In 1956, Hubbert accurately predicted that oil production in the 48 lower US states would peak around 1970. His method is deceptively simple: when half of the total supply has been extracted, the peak of production has been reached. In 1974 he predicted that global production would peak around 1995. Using his very simple methodology, others have applied contemporary data and predicted a global peak soon after 2000. Other experts give dates as late as 2020. One thing is certain: oil reserves are finite. We have already burned at least a third of all the recoverable oil that ever existed, and consumption is doubling every 35 years.

Car exhausts and motor oil changes dumped down drains account for more oil entering the oceans than any other source. Greenpeace



The March 1998 issue of *Scientific American* carried an excellent series of articles entitled, "The End of Cheap Oil." Hubbert's work figures prominently in the discussion.

Oil production from all non-OPEC nations has already peaked, as has production from all of the world's 37 largest fields.

Walker & Kanaki, *Chemical Engineering in Australia* 14(4): pp6-9, 1988 (from Newman & Kenworthy, 50)

Even some big oil companies now admit that the peak will come between 2010 and 2020.

Newman & Kenworthy, 50

Almost the entire world has now been intensively explored for oil using technologies that didn't exist a few decades ago. During the period 1982-1992, the 30 largest oil companies invested US\$417 billion in oil and gas exploration and development, but only found oil and gas worth US\$170 billion.

Some 75% of all oil has been found in giant fields, ones larger than 500 million barrels, and we have found very few giants since the 1980s. Oil consumption is about 23 billion barrels per year and rising, while discoveries are running about 7 billion barrels per year and falling.

From a posting to the SusTrans list
by Charlie Richardson

For those who say that new discoveries will save the day, the news is bad: oil discoveries peaked in 1962 and now run at only a third the rate of consumption. It is true that Saudi Arabia sits atop a vast pool of oil, and Saudi production may peak as late as 2020. By then, however, oil production from all other nations will be in fairly rapid decline.

It is therefore only a question of time before the rate of oil production begins to fall. Petroleum prices will probably rise inexorably after 2010, perhaps much sooner.

CARS ARE DRIVING US POOR

The monetary costs of transport have a large effect on standards of living. The prosperity of the industrialized nations has made it possible to provide most adults with their own cars, fuel to run them, and roads enough to drive on, but the direct economic costs are high. The cost of private automobile transport is a substantial fraction of most family budgets in the USA. While the capital costs of rail systems are high (although not particularly so in comparison to the costs of roads), their operating and energy costs are relatively modest in comparison to private cars. The difference will become steadily more important in the years ahead, as energy becomes scarcer and therefore more expensive.

The Myth: Drivers Pay Their Way

Who pays for automobility? Many people think that drivers pay the full cost of their driving. Researchers agree that this is far from being the case. John Holtzclaw of the Sierra Club summarized various research studies of what the pump price of a gallon of gasoline would have to be to cover the costs of driving. When the externalities are considered, the true cost of a gallon of gasoline rises to over \$10.00.

\$4.00/gallon is equivalent to \$1.06/liter, which is roughly the price of gasoline in western Europe.

<i>Researcher</i>	<i>Real cost of fuel, \$/gal</i>
Ketcham & Komanoff	5.53
Litman	7.08
Mackenzie, Dower & Chen	3.03
Moffet & Miller	2.86 - 5.00
Vorhees	4.78
Delucchi	3.13 - 7.55
US Office of Technology Assessment (OTA)	3.39 - 6.81
OTA, including non-monetary personal costs	11.17 - 16.11

<http://www.sierraclub.org/sprawl/transportation/subsidies.asp>

The Reality: The Public Subsidizes Drivers

The following costs are often omitted in calculations of the costs of automobility:

- Damage to the social fabric
- Subsidies to public transit due to reduced ridership
- Capital & maintenance costs of parking lots
- Injuries to other street users
- Petroleum production subsidies
- Military actions to protect petroleum supplies
- Reduction in real estate values caused by nearby roads
- Lost property taxes on land occupied by streets
- Vibration damage to structures
- Noise-related stress
- Additional police, fire & ambulance services
- Global warming & coastal flooding
- Air, water & land pollution

Capital and operating costs for parking are much higher than one might expect. Capital costs for simple surface parking lots are \$7967 per space, with an annual operating cost of \$995. Multilevel parking structures can cost as much as \$60,857 per space to build, with annual costs of \$4504. Drivers often do not pay these costs themselves: the costs are absorbed by employers and merchants. This means, of course, that non-drivers also pay part of the cost of parking, since these costs are reflected in higher prices.

Warren, 15, quoting
Shelley L. Smith, "The Stuff of Parking,"
Urban Land, Feb. 1990, page 38

TRAFFIC CALMING

Much work has been done to tame the car in the city. These projects, generally known as "traffic calming," attempt to curb the worst excesses of drivers, but many of these measures bring unexpected side effects. For instance, while speed