Using Public Policies to Promote Walking, Cycling, and Public Transport

John Pucher, Rutgers University

http://policy.rutgers.edu/faculty/pucher/
Worldwide Travel Trends

- Increasing daily travel distances
- Increasing car ownership and use
- Increased public transport use, but falling mode share
- Less walking almost everywhere
- Low or falling cycling levels except in northern Europe
Growth in Passenger Car Ownership in Europe, 1970-2002
(cars per 1,000 population)

Source: European Commission, Energy and Transport in Figures, 2004

Pucher: Public Policies for Sustainable Transport
Cars and Light Trucks per 1,000 population in USA and Western Europe

USA, GER, UK, NL, DK
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>USA (2001)</td>
<td>2%</td>
<td>1%</td>
<td>8%</td>
<td>11%</td>
<td>13%</td>
<td>16%</td>
<td>24%</td>
<td>22%</td>
<td>16%</td>
<td>4%</td>
<td>15%</td>
<td>9%</td>
<td>5%</td>
<td>25%</td>
</tr>
<tr>
<td>Canada (2001)*</td>
<td>9%</td>
<td>1%</td>
<td>8%</td>
<td>11%</td>
<td>13%</td>
<td>16%</td>
<td>24%</td>
<td>22%</td>
<td>16%</td>
<td>4%</td>
<td>15%</td>
<td>9%</td>
<td>5%</td>
<td>25%</td>
</tr>
<tr>
<td>Ireland (2006)*</td>
<td>2%</td>
<td>1%</td>
<td>8%</td>
<td>11%</td>
<td>13%</td>
<td>16%</td>
<td>24%</td>
<td>22%</td>
<td>16%</td>
<td>4%</td>
<td>15%</td>
<td>9%</td>
<td>5%</td>
<td>25%</td>
</tr>
<tr>
<td>Belgium (1999)</td>
<td>9%</td>
<td>1%</td>
<td>8%</td>
<td>11%</td>
<td>13%</td>
<td>16%</td>
<td>24%</td>
<td>22%</td>
<td>16%</td>
<td>4%</td>
<td>15%</td>
<td>9%</td>
<td>5%</td>
<td>25%</td>
</tr>
<tr>
<td>France (1994)</td>
<td>2%</td>
<td>1%</td>
<td>8%</td>
<td>11%</td>
<td>13%</td>
<td>16%</td>
<td>24%</td>
<td>22%</td>
<td>16%</td>
<td>4%</td>
<td>15%</td>
<td>9%</td>
<td>5%</td>
<td>25%</td>
</tr>
<tr>
<td>UK (2006)</td>
<td>9%</td>
<td>1%</td>
<td>8%</td>
<td>11%</td>
<td>13%</td>
<td>16%</td>
<td>24%</td>
<td>22%</td>
<td>16%</td>
<td>4%</td>
<td>15%</td>
<td>9%</td>
<td>5%</td>
<td>25%</td>
</tr>
<tr>
<td>Denmark (2001)</td>
<td>10%</td>
<td>2%</td>
<td>4%</td>
<td>15%</td>
<td>9%</td>
<td>8%</td>
<td>17%</td>
<td>9%</td>
<td>11%</td>
<td>9%</td>
<td>11%</td>
<td>9%</td>
<td>5%</td>
<td>25%</td>
</tr>
<tr>
<td>Finland (2003)</td>
<td>8%</td>
<td>8%</td>
<td>8%</td>
<td>8%</td>
<td>8%</td>
<td>23%</td>
<td>23%</td>
<td>11%</td>
<td>23%</td>
<td>24%</td>
<td>25%</td>
<td>5%</td>
<td>22%</td>
<td>22%</td>
</tr>
<tr>
<td>Germany (2005)</td>
<td>9%</td>
<td>9%</td>
<td>9%</td>
<td>9%</td>
<td>9%</td>
<td>23%</td>
<td>23%</td>
<td>11%</td>
<td>23%</td>
<td>24%</td>
<td>25%</td>
<td>5%</td>
<td>22%</td>
<td>22%</td>
</tr>
<tr>
<td>Austria (2005)</td>
<td>4%</td>
<td>4%</td>
<td>4%</td>
<td>4%</td>
<td>9%</td>
<td>8%</td>
<td>8%</td>
<td>8%</td>
<td>8%</td>
<td>8%</td>
<td>8%</td>
<td>5%</td>
<td>22%</td>
<td>22%</td>
</tr>
<tr>
<td>Sweden (2006)</td>
<td>11%</td>
<td>11%</td>
<td>11%</td>
<td>11%</td>
<td>11%</td>
<td>11%</td>
<td>11%</td>
<td>11%</td>
<td>11%</td>
<td>11%</td>
<td>11%</td>
<td>11%</td>
<td>11%</td>
<td>11%</td>
</tr>
<tr>
<td>Finland (1999)</td>
<td>9%</td>
<td>9%</td>
<td>9%</td>
<td>9%</td>
<td>9%</td>
<td>9%</td>
<td>9%</td>
<td>9%</td>
<td>9%</td>
<td>9%</td>
<td>9%</td>
<td>9%</td>
<td>9%</td>
<td>9%</td>
</tr>
<tr>
<td>Spain (2000)**</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
</tr>
</tbody>
</table>
Walking and Bicycling Shares of Urban Travel by Age Group in the USA, Germany and The Netherlands

Percentage of Short Trips Made by Walking and Cycling in Germany (2002) and the USA (2001)

Source: Ralph Buehler, "Travel Behavior in Germany and the USA"
Consequences of Car Dependence

- Increasing energy use and Greenhouse Gases
- Noise, air and water pollution
- Worsening traffic congestion
- Scarce urban land used for roads and parking
- Traffic fatalities and injuries
- Mobility problems for the poor, the elderly, children, and women
- Insufficient physical activity and rising obesity
Does auto-dependency make us fat? Obesity falls sharply with increased walking, cycling, and transit use!
If car-dependence is the problem, then we should improve alternatives to the car:

PUBLIC TRANSPORT
WALKING
CYCLING
Walking and Cycling: the *MOST* sustainable transport modes

- **MOST environmentally friendly:**
  > Virtually no pollution at all
  > Almost no nonrenewable resources used

- **MOST equitable:**
  > Financially affordable by virtually everyone
  > Physically possible by all but the severely disabled

- **MOST economical:**
  > Minimal private and public costs
  > Although they take more time, they provide exercise that reduces medical costs and greatly extends our healthy life expectancy
Getting around Copenhagen on the perfect Zero Emissions Vehicle: the BIKE!

Photo: Susan Handy
Public Policies *Crucial* to Transit, Walking, and Cycling

- Pro-car policies in European cities in 1950s and 1960s caused huge decline in walking and cycling
- Dramatic policy turn-around since 1970s to limit car use and promote cycling, walking, and public transport in Dutch, Danish, and German cities
Transformation of German Urban Planning and Transport Policies since 1950s

In 1953, prior to massive car use

Lots of cycling and few cars in city center

Lörrach, Turmstrasse 1953
In 1972, just before urban planning and transport reforms, Car-dominated ugliness
In 2006, after car-restrictive reforms, return to civility, keeping out cars completely and reserving city center for pedestrians and cyclists.
Bridge in Freiburg BEFORE and AFTER reforms

Pucher: Public Policies for Sustainable Transport
Typical residential street in Freiburg BEFORE and AFTER traffic calming reforms
Cathedral Square in Freiburg BEFORE transport and urban planning reforms
Cathedral Square in Freiburg AFTER transport and urban planning reforms
# German Cycling Boom Engineered by Explicit Shifts in Transport Policy in 1970s

<table>
<thead>
<tr>
<th>City</th>
<th>Time Period</th>
<th>Change in Bicycle Modal Split Share</th>
<th>Percentage Increase in Bicycle Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Munich</td>
<td>1976 to 1996</td>
<td>6% to 13%</td>
<td>+117%</td>
</tr>
<tr>
<td>Nuremberg</td>
<td>1976 to 2001</td>
<td>4% to 9%</td>
<td>+125%</td>
</tr>
<tr>
<td>Cologne</td>
<td>1976 to 1998</td>
<td>6% to 12%</td>
<td>+100%</td>
</tr>
<tr>
<td>Freiburg</td>
<td>1976 to 1998</td>
<td>12% to 19%</td>
<td>+58%</td>
</tr>
<tr>
<td>Stuttgart</td>
<td>1976 to 2000</td>
<td>2% to 6%</td>
<td>+200%</td>
</tr>
<tr>
<td>Bremen</td>
<td>1976 to 1997</td>
<td>16% to 21%</td>
<td>+31%</td>
</tr>
<tr>
<td>Muenster</td>
<td>1976 to 2001</td>
<td>29% to 35%</td>
<td>+21%</td>
</tr>
<tr>
<td>Average for all urban areas in Western Germany</td>
<td>1972 to 2002</td>
<td>8% to 10%</td>
<td>+25%</td>
</tr>
</tbody>
</table>

Overview of Coordinated Policies that Encourage Transit Use, Walking, and Cycling in Europe

• Expansion and modernization of public transport systems
• Continual improvement of pedestrian and cyclist facilities
• Full integration of walk, bike, transit modes
• Sharp restrictions on car use in central cities
• High cost of car ownership and use
• Land-use policies that discourage suburban sprawl
Expansion and Upgrading of Public Transport Systems

- More metro and light rail service
- Upgrading of bus services, including some BRT
- Modernization of transit vehicles and stations
- Reserved bus/tram lanes and signal priority
- Coordination of all transit services through a unified regional transit agency (Verkehrsverbund)
- Attractive monthly and annual passes
- Expanded bike-and-ride and park-and-ride facilities
Complete Coordination and Integration of Public Transport in Germany

- **Verkehrsverbünde** (regional transit authorities)
- Allocate operating assistance over operators (public and private)
- **Fully integrate** all transit services, all modes, all fares, schedules, routes in entire region
Quick and easy transfer between suburban rail, long-distance rail, and light rail transit modes in Germany.
Radstation: Bike parking facility in Muenster, Germany (3,500 bikes) immediately adjacent to main train station and bus terminal
Real Time Information at Light Rail Stops in Freiburg
Continual Improvement of Pedestrian and Bicyclist Facilities

- Traffic-calmed residential neighborhoods
- Massive increase in bikeways, bike lanes, intersection modifications for cyclists, priority signals
- Extensive car-free zones, speed reductions, and other restrictions on thru motor vehicle traffic
- Improvements in crosswalks, lighting, sidewalks, signals
- Vast increase in bike parking, including parking garages, especially at transit stations
- Extensive cycling education and training in all primary schools
- Full integration of walk/bike facilities with bus and rail transit stops and bike transport on transit vehicles
Most European cities have extensive car-free districts ideal for walking and cycling.
Lively, safe, pleasant car-free zone in central Copenhagen
Typical intersection in Copenhagen, with separate crossings for pedestrians and cyclists
Bike-walk Promenade in Muenster, Germany

This 6 km beltway encircles central city and connects 16 major bike paths radiating outward toward the suburbs and 26 bike paths and lanes leading to Cathedral Square.

Note exclusive cycle path in middle and completely separate pedestrian walkways on both sides.
GIVE EMPLOYEES FREE BIKES INSTEAD OF FREE PARKING!

The perfect zero emissions vehicles!

Troels Andersen, “Cycling in Odense, Denmark”
Sharp Restrictions and High Taxes on Auto Use, Ownership, Licensing

- High taxes on petrol and new car purchases
- Expensive and limited car parking
- High cost and difficulty of obtaining driver’s license
- Slowdowns in roadway expansion and exclusion of limited-access motorways from city centers
- Tempo 30km/hr (or 7km/hr) in residential neighborhoods
- Turn restrictions, artificial dead-ends, thru traffic restrictions for cars and trucks
- Strict enforcement of traffic regulations favoring pedestrians and cyclists, with motorists usually assumed guilty of any crash, especially with elderly or children
Why Traffic Calming Saves Lives

Figure 1.1  Probability of fatal injury for a pedestrian colliding with a vehicle

Many residential neighborhoods in German, Dutch, and Danish cities are traffic calmed.

Reduced car speeds increase traffic safety and encourage walking and cycling.
Taxes on New Car Purchases in Europe and the USA
(percent tax on purchase price in 2005, average car)

Source: European Commission, Energy and Transport in Figures, 2006
Premium Unleaded Gasoline Prices and Share of Taxes in Selected OECD Countries in 2007 (U.S. $ per Liter)

United States  Canada  Switzerland  Austria  Sweden  Denmark  Italy  France  Belgium  Germany  Finland  United Kingdom  Netherlands  Norway

Trends in Gasoline Prices in 7 OECD Countries (in US dollars), 1996-2008
Land-Use Policies that Discourage Suburban Sprawl

• **Strict land use zoning** to preserve open space, agricultural areas, forests in immediate proximity to cities

• Explicit federal, state, regional, and local land use plans that ensure *mixed-use, compact development* and coordination of land use with transportation

• **Tax preferences** for land used for agriculture, open space, nature preserves, in addition to strict prohibitions on commercial and residential use of such land

• **Higher price** of legally developable land forces higher development densities in metropolitan areas
• Top-down, bottom-up coordination of land use planning among all four levels of government in Germany

• Coordination of land use, transportation, and environment at each level

Source: German Federal Office of Construction and Land Use Planning, 2000
Keys to Success in Europe:

1) **Improving all forms of public transport**, fully integrating and coordinating them with each other, and offering attractive fares

2) **Improving cycling and walking conditions** and integrating them with public transport services, so that these three modes together can provide a feasible alternative to the car

3) **Making car use as resistible as possible** by imposing high taxes, fees, and other user charges, restricting car use, limiting parking, and making it both difficult and expensive to get a license

4) **Strict land-use policies** to keep metropolitan areas compact and trip distances short so that public transport, walking, and cycling remain feasible ways to get around
For any questions or further information, please contact:

Prof. John Pucher
Bloustein School of Planning and Public Policy
Rutgers University
33 Livingston Avenue, Room 363
New Brunswick, New Jersey 08901
Email: pucher@rutgers.edu
Webpage: http://policy.rutgers.edu/faculty/pucher.html
Suggested readings and additional slides on travel trends and problems in Asia, Europe, and North America

For details, please consult these overview articles:


Additional slides follow
Passenger Cars per 1,000 People in China and India, (1991-2006)

Per Capita Income Trends in China and India (1972 – 2007)

Source: Organization for Economic Cooperation and Development (OECD)

Note: Per Capita Incomes for both China and India are expressed here in constant, inflation-adjusted 1996 US dollars, using purchasing power parity for currency conversion.
Motorcycles per 1,000 People in China & India (1976 – 2006)

Car Ownership and Economic Growth: Is China just following the trend?

Source: Lee Schipper and Embarq, World Resources Institute (2008)
Motor Vehicle Ownership by Selected Region

Source: EIA, IEO2008
Roadway congestion and air pollution are increasingly serious problems in large Chinese cities (Beijing shown here)
Peak hour traffic congestion in Delhi

Pucher: Public Policies for Sustainable Transport
Percent Distribution of Urban Trips by Means of Travel for Selected Chinese Cities, 2000

- Beijing (14.81M)
- Shanghai (18.41M)
- Tianjin (10.11M)
- Shi (9.17M)
- Hangzhou (6.43M)
- Nanjing (5.72M)
Percent Distribution of Urban Trips by Means of Travel for Selected Indian Cities, 2002

- Walk
- Non-motorized Vehicles
- Private motorized
- Public Transport

Cities and their trips:
- Mumbai (16.3M)
- Kolkata (13.2M)
- Delhi (12.79M)
- Chennai (6.4M)
- Bangalore (5.68M)
- Hyderabad (5.53M)
- Ahmedabad (4.51M)
- Pune (3.755M)
- Kanpur (2.69M)
- Lucknow (2.26M)
Growth of India's Motor Vehicle Fleet by Type of Vehicle
(1981 - 2002)

No. of Vehicles (in millions)

- Two-wheelers
- Cars, Jeeps and Taxis
- Other Motorized
- Goods Vehicles
- Buses

- Two wheelers
- Cars, Jeeps and Taxis
- Other Motorized
- Goods Vehicles
- Buses

No. of Vehicles (in millions)
Traffic Fatalities in India and China (1972-2002)

Traffic Fatalities (in thousands)

- India
- China

Air Pollution in Chinese and Indian Cities

- **Particulate Matter (PM 10)**
- **Sulphur Oxides (SOx)**
- **Nitrogen Oxides (NOx)**

Pollution concentration in micrograms per cubic meter

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Beijing (14.81M)</td>
<td>Mumbai (16.3M)</td>
</tr>
<tr>
<td>Shanghai (13.41M)</td>
<td>Kolkata (13.21M)</td>
</tr>
<tr>
<td>Chengdu (10.44M)</td>
<td>Delhi (12.79M)</td>
</tr>
<tr>
<td>Tianjin (10.11M)</td>
<td>Chennai (6.42M)</td>
</tr>
<tr>
<td>Shi Jiazhuang (9.17M)</td>
<td>Bangalore (5.68M)</td>
</tr>
<tr>
<td>Wuhan (7.68M)</td>
<td></td>
</tr>
<tr>
<td>Xian (7.41M)</td>
<td></td>
</tr>
<tr>
<td>Guangzhou (7.25M)</td>
<td></td>
</tr>
<tr>
<td>Shenyang (7.2M)</td>
<td></td>
</tr>
<tr>
<td>Shenyang (7.2M)</td>
<td></td>
</tr>
<tr>
<td>Hangzhou (6.43M)</td>
<td></td>
</tr>
<tr>
<td>Nanjing (5.72M)</td>
<td></td>
</tr>
<tr>
<td>Chongqing (3.1M)</td>
<td></td>
</tr>
<tr>
<td>Wuhan (7.68M)</td>
<td></td>
</tr>
<tr>
<td>Xian (7.41M)</td>
<td></td>
</tr>
<tr>
<td>Guangzhou (7.25M)</td>
<td></td>
</tr>
<tr>
<td>Shenyang (7.2M)</td>
<td></td>
</tr>
<tr>
<td>Shenyang (7.2M)</td>
<td></td>
</tr>
<tr>
<td>Hangzhou (6.43M)</td>
<td></td>
</tr>
<tr>
<td>Nanjing (5.72M)</td>
<td></td>
</tr>
<tr>
<td>Chongqing (3.1M)</td>
<td></td>
</tr>
</tbody>
</table>
Traffic Congestion in Beijing
Severe roadway congestion in large Indian cities

- Traffic levels exceed road capacity
- Rapid growth in motorized vehicles
- Very mixed traffic on roads

Improvements in infrastructure have not kept up with sharply rising demand
• Rickshaw operation: uncontrolled & poor
• Road space: minimum for bus
• Reduce bus speed and increase cost

Congestion in Dhaka, Bangladesh
Congestion worsened by mixing of motorized and non-motorized modes