Cycling to the Future: Lessons from Cities across the Globe

John Pucher, Rutgers University
Ralph Buehler, Virginia Tech
Advantages of Cycling:

• **Economical:** Affordable by everyone, requiring minimal costs for individuals and governments
• **Good for business:** Generate retail sales and profits from tourism
• **No pollution:** Clean and quiet
• **Energy-efficient:** Use up calories we need to burn off from eating too much
• **Healthy:** Many studies report on physical, social, mental health benefits
• **Fun:** Getting out into the fresh air with family and friends
Cycling Share of Daily Trips in Europe, North America, and Australia, 1999-2008

Bicycle Share of Work Commuters in the USA (2007) and Canada (2006)

Lots of Potential for Increased Cycling:

Many daily trips in American urban areas are short enough to walk or bike!

- ~27% of all trips in the U.S. were a mile or shorter in 2009
- ~41% of all trips were shorter than two miles
Share of Cycling for Short Trips

Women’s Share of Bike Trips in Europe and North America

55% of all bike trips in Denmark are by women

Photo  Susan Handy
More women on bikes = More cycling
More cycling = More women on bikes

Bicycle share of trips and percentage of female cyclists in 14 large cities

More women on bikes = More cycling
More cycling = More women on bikes

Bicycle share of commuter trips and percentage of female cyclists in Melbourne neighborhoods

Bike Share of Trips by Age Group

Cycling for ALL AGES
Cycling facilities should also be safe for persons with disabilities, and bikes *CAN* be adapted to their needs.
Make Cycling Safe for Everyone!

- Especially important for the young, the old, for anyone with disabilities, for the timid or risk-averse
- Women more sensitive to safety than men
- Safety of cycling in the Netherlands, Denmark, and Germany helps explain high levels of cycling there
Cycling can be made very safe, as in the Netherlands and Denmark.

Trends in Cyclist Fatalities

Reversal in Public Policies in Germany, Denmark, and the Netherlands in 1970s

• Pro-car policies in European cities in 1950s and 1960s caused huge decline in cycling and walking

• Dramatic policy turn-around since 1970s to limit car use and promote cycling, walking, and public transport in Dutch, Danish, and German cities
Bridge in Freiburg BEFORE and AFTER reforms

1960s

Today
Typical residential street in Freiburg BEFORE traffic calming reforms

Typical residential street in Freiburg AFTER traffic calming reforms
Rebound of Bike Share of Trips in German, Dutch, and Danish Cities

Recent Boom in Pro-Bike Policies in Many Cities

• Especially since 2000, European and North American cities without a tradition of cycling for daily travel have dramatically raised cycling levels

• Improved cycling infrastructure and many other measures to encourage cycling
More and better cycling facilities have dramatically increased bike share of trips in cities without any tradition of cycling for daily travel.

Cycling in Sevilla, Spain increased more than 10-fold after these safe cycle tracks were installed.
Boom in Cycling to Work in 14 Large US and Canadian Cities


*2011 figures for Canadian cities are preliminary estimates*
Sharp increase in cycling safety in Portland as cycling levels rose

6-fold increase in bike trips

70% fall in crash rate

Source: City of Portland (2013)
How to Encourage More Cycling while Improving Safety

• Better cycling facilities
• Integration of cycling with public transport
• Traffic calming of residential neighborhoods
• Mixed-use zoning and improved urban design
• Restrictions on motor vehicle use
• Traffic education and Safe Routes to School
• Traffic regulations and enforcement
Most European cities have extensive car-free districts ideal for walking and cycling
Cycling is perfect for getting around car-free college campuses such as here at UC Santa Barbara.
Santa Barbara coastal path: Safe and attractive both for cyclists and pedestrians

Conversion of two car lanes to bike path and wider sidewalk

Source: Ralph Fertig
Bike paths in Dutch cities make it safe and comfortable for all to bike: including women, children, and seniors.

Source: Warren Salomon
One-way cycle track in The Hague

Raised curb between cycle track and traffic lane

Source: Peter Furth
Almost 100km of 2-way cycle tracks in Montreal

Separation from traffic via bollards and parked cars

Separation from traffic via concrete barriers

Photo: Peter Furth

Photo: Velo Quebec
Provision of cycle track at this key underpass in Montreal

Separation from traffic via concrete barriers AND bollards

Photo: Velo Quebec
Traffic-protected cycle track on 9th Avenue, NYC

- 380 mi of new bike lanes and paths since 2000
- Quadrupling in bike trips since 2000
- 74% decrease in serious cyclist injuries
- 56% increase in retail sales along cycle tracks

Photo: NYC DOT
Mayor Boris Johnson’s planned 15-mile east-west cycle track through the heart of London along Thames River.
Cycle track on Pennsylvania Avenue in Washington

Photo: Ralph Buehler
This cycle track in St. Petersburg, Florida has increased cycling by senior citizens and women.

Source: Alta Planning
Cultural Heritage cycle track in Indianapolis

Tripling in cycling in Indianapolis since 2000

Construction and maintenance financed by private foundation

Photos: Ralph Buehler
This cycle track in Arkansas was financed by Walmart for employees to bike to its headquarters office.

Source: Alta Planning
Transformation of Hornby Street in Vancouver with installation of first-class cycle track
Over 6km of cycle tracks in Vancouver with more planned.

Photo: Paul Krueger
Seattle’s first cycle track in 2013 on Linden Avenue, many more planned
Improving safety of cycle tracks at road crossings

Raised crossing for both cyclist and cars, with special pavement and markings

Photo: Warren Salomon
Safe cycle track crossing at busy intersection in Montreal

Photo: Velo Quebec
Bike lanes are much more typical in US cities

Photo: Ralph Fertig

Photo: Lewis Thorwaldson
All streets should come complete with safe facilities for pedestrians and cyclists.
Contra-flow lanes facilitate bike travel in both directions on one-way streets for cars.
Bike lanes in Seattle
But bike lanes are definitely better than no separate bike facilities, but they do not provide nearly as much protection of cyclists from motor vehicles as cycle tracks.
Buffered bike lanes offer some additional separation from motor vehicle traffic but without physical barriers.
How to destroy the benefits of a buffered bike lane: Dearborn Street in Seattle

Photo: Bob Edmiston
Bridge connections crucial for an integrated cycling network

About 20,000 daily bike trips over Portland bridges

Photo: Greg Raisman
Bike paths on the four East River bridges provide crucial connections from Brooklyn and Queens to Manhattan.

Source: Transportation Alternatives NYC
Overpass for cyclists and pedestrians in Seattle

Photos: Seattle DOT
Good bike bridge included as part of the Canada Line extension of Skytrain in Metro Vancouver

Source: Translink
Bike path on south entry to Lion’s Gate Bridge in Vancouver

Foto: Gordon Price
Special traffic signals and signs improve cycling safety
Four-way all-green signal for cyclists in Portland

How to Use the New Bicycle Signal

1. TO GET A GREEN LIGHT
   Place your bicycle on the marking on the sidewalk, with your wheels directly on the lines.

2. When the bicycle signal here is green...

3. ...cyclists can cross the intersection as shown here.

Bike sensor in pavement
Red bike lanes for intersection crossings, connected with red brick sidepaths on both sides of every road

Source: City of Muenster, Germany
Bike lane, advance stop line, and special signal for cyclists in Germany
Bike boxes in Seattle also

Photo: Seattle DOT
Bike boxes in Vancouver

Foto: Gord Price
Foto: Rich Drdul
Why Traffic Calming Saves Lives

Speed kills!

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

Traffic Calming in Freiburg, Germany
Cheap, easy, fast, and effective improvement in cycling safety
3,800 km of traffic-calmed streets in Berlin: ideal for cycling: 78% of ALL streets in Berlin!

These streets are, in effect, bike boulevards, neighborhood greenways, and local street bikeways.

Photo: Peter Berkeley
Shared streets: Typical traffic calming in new German suburbs

7 km/hr speed limit
Shared street in Indianapolis

Photo: Ralph Buehler
Blockage of through car and truck traffic but convenient cut-through for cyclists and pedestrians
Traffic calming in Québec City and Montreal

Cheap, easy, and very effective traffic diverters
Traffic diverter in Berkeley which provides a through connection for two bike boulevards

Source: Eric Anderson

Bollard blocks passage of cars
152km of bike boulevards in Vancouver
Cut-thrus along bike boulevards in Vancouver
Passage for cyclists through median island at Burnaby intersection in Metro Vancouver
Traffic calming in Vancouver that creates bike boulevards
Traffic calming turns these streets into bikeways

112 km of bike boulevards in Portland

Photos: Jonathan Maus
### Dutch bicycle facility selection matrix

<table>
<thead>
<tr>
<th>Lane Configuration</th>
<th>Average daily traffic (vehicles / day)</th>
<th>Street type and speed limit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Urban local street</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30 km/h (19 mph)</td>
</tr>
<tr>
<td>2-way traffic with no centerline</td>
<td>≤ 2500</td>
<td>mixed traffic(^1)</td>
</tr>
<tr>
<td></td>
<td>2000 to 3000</td>
<td>bike lane (^3)</td>
</tr>
<tr>
<td></td>
<td>3000 to 5000</td>
<td>bike lane or cycle track (^3)</td>
</tr>
<tr>
<td></td>
<td>&gt; 4000</td>
<td>bike lane or cycle track (^3)</td>
</tr>
<tr>
<td>2 lanes (1+1)</td>
<td>any</td>
<td>bike lane or cycle track (^3)</td>
</tr>
<tr>
<td>4 lanes (2 + 2) or more</td>
<td>any</td>
<td>(does not exist)</td>
</tr>
</tbody>
</table>

Cycling facilities are much cheaper to build than new or widened roadways

- $12-$150 million per km for new or widened roadway
- $1.0-3.2 million per km for physically separated cycle track
- $40k-90k per km for on-street bike lane
- $100k-250k per km of bike boulevard (also known as neighborhood greenways or local street bikeways)

Roads about TEN times more expensive than even the most elaborate urban cycle tracks!
Cycling has doubled in Sydney, Australia since installation of its cycle track network.

Economic benefits of this cycle track exceed costs by over three-to-one!

Photo: Fiona Campbell
BIKE TRANSIT INTEGRATION
Over 50,000 buses in the USA now come equipped with bike racks, as here in Santa Barbara.

Source: Ralph Fertig
Bike on LRT in NJ and Minneapolis

Photo: Metro Transit

Photo: John Boyle
Bike Station next to main train station in Muenster, Germany

Capacity: 3,500 bikes

Photo: Peter Berkeley
Capacity: 150 bikes

Bike Station next to Union Station in Washington, D.C.
Bike-transit integration at Alewife Station on Red Line in Boston

300 bike parking spaces in two bike cages at northern terminus of subway line in Boston

Photo: David Loutzenheiser
Bikes on Caltrain in San Francisco
Bi-directional cycle track and bike sharing near metro station in Montréal

Source: Vélo Québec
Nice Ride in Minneapolis

Over 50 bike sharing systems in North America by end of 2013

Hubway Bikeshare in Cambridge, Boston, Somerville, and Brookline

Capital Bikeshare in Washington, DC
Citi Bike in New York

- Launched May 27, 2013
- 6,000 bikes
- 330 bike stations
- Over 20,000 annual members

Which is the cheaper and more sensible way to get exercise?

Photo: Alta Planning
Innovative directional signs and bike trip counters in Denmark

Photo by Susan Handy
Convenient, free air pumps for bikes on local neighborhood bikeways in Vancouver
Good bike parking benefits merchants

27 bike corrals in San Francisco

97 bike corrals in Portland
Children who bike or walk to school learn better:

- More attentive and able to concentrate
- Advanced mental alertness by half a school year
- More benefit for mental development than having breakfast and lunch

Source: Egelund et al. (2012). Study of over 20,000 school children
Safe Routes to Schools

Photos: Bike Texas
Bike path leads directly to school in NL
After installation of this cycle track in Sydney, Australia, over a third of children now bike to school!
Most German and Dutch children take cycling lessons by the 3rd or 4th grade and must pass a police-administered cycling safety test!
Bike Training for Children in New Jersey

Source: NJ Bike Walk Coalition
Cycling training course for adults

Photo: Bonnie Fenton

Foto: Amy Walker
Guided Bicycle Tours for Seniors

Source: Troels Andersen
Bike to Work Day in San Francisco

Source: San Francisco Bicycle Coalition
GIVE EMPLOYEES FREE BIKES!

The perfect zero emissions vehicles!

Photo: Troels Andersen
Over 100,000 participants at LA’s fourth annual CicLAvia in October 2012

Source: Ryan Snyder

CicLAvia: 9 miles of car-free streets in Los Angeles
Expansion of Open Streets (Ciclovias) in the Americas
(cities with at least two events per year)

The Summer Solstice naked bike ride in Seattle can be fun as well, provided you have the right body!
Implementation Strategies

1. **Publicize** both individual and societal benefits
2. **Ensure** **citizen participation** at all stages of planning and implementation
3. Develop long-range **bike plans**; regularly update them
4. Implement controversial policies in **stages**, easiest first
5. Combine **incentives** for cycling and walking with **disincentives** for car use
6. **Build alliances** among ped/bike groups and with transit, environmentalists, public health, business leaders, politicians, and media
7. **Coordinate** ped/bike advocacy and planning through local, regional, and national organizations
8. Local **political leadership** is essential
New book with MIT Press

http://citycyclingbook.wordpress.com

About the authors:

http://policy.rutgers.edu/faculty/pucher/

http://ralphbu.wordpress.com
CONCLUSIONS

• Many economic, environmental, social, and health benefits of cycling

• Even in North America, many local trips are short enough to cover by cycling

• Many cities throughout the USA and Canada are vastly improving their cycling facilities

• But much more could be done, and there are many ways to do it.