

# striving for greener cities: public transit in the modern metropolis

Comparing European and American Public Transit models to find ways to improve how we travel

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# Why Public Transit Matters

- **Automotive traffic** is one of two of the biggest contributors to air pollution in the Czech Republic (not only exhaust fumes, but also abrasion of tires and brakes and road surface)
- It is also one of two of the biggest factors behind greenhouse gas emissions
- Road transportation (which is responsible for almost all pollution from transportation) accounted for 32 % of NO<sub>x</sub>, 23 % of VOC, 33 % of PM<sub>10</sub> and 46 % of PM<sub>2.5</sub> emissions in 2006.
- **the share of road transport is increasing**

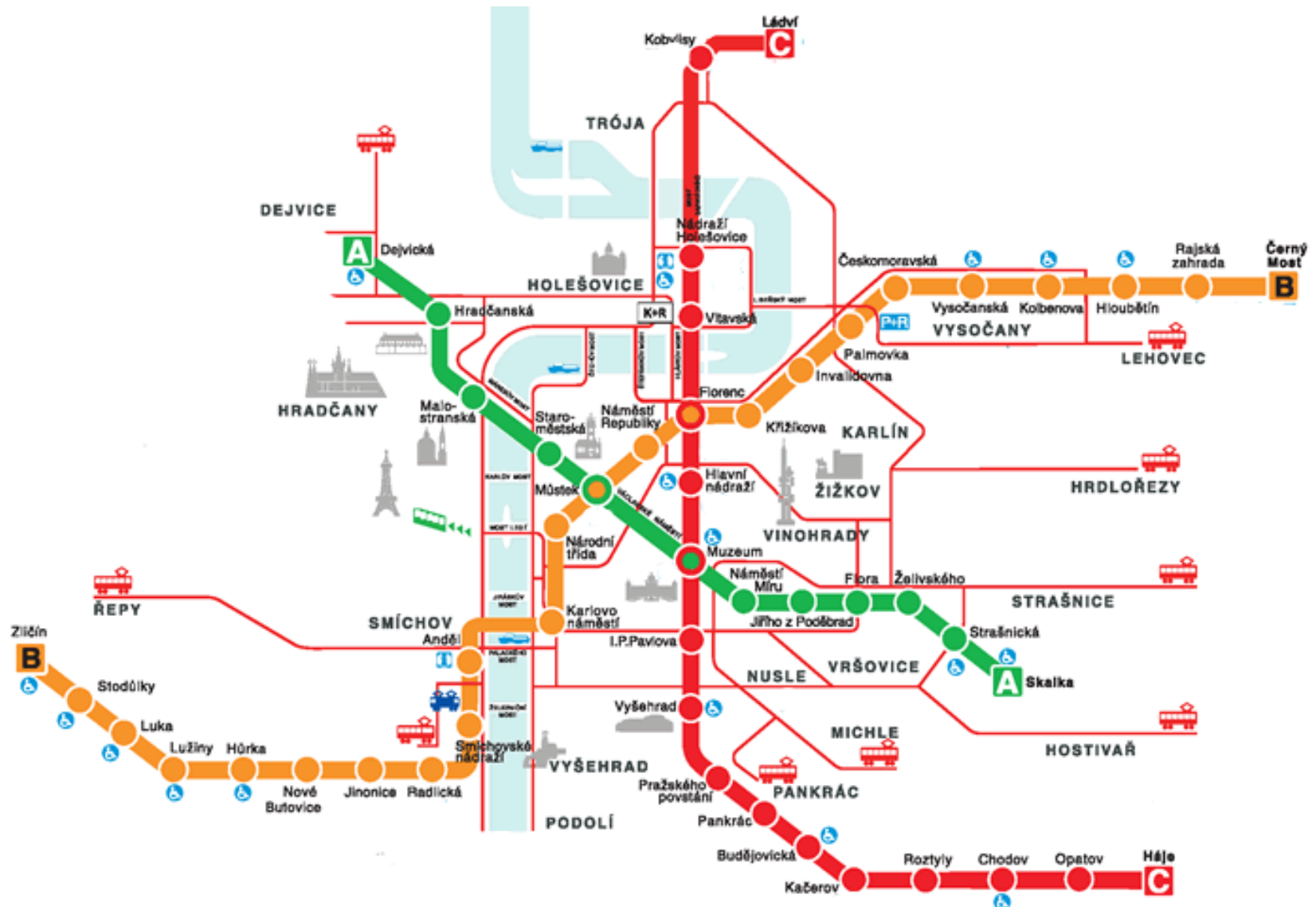
**Obviously, the problems associated with cars and carbon emissions are not limited to the Czech Republic.**

# Prague Public Transit

## *Metro System*

- .60 kilometers of track
- .57 total stations
- .7<sup>th</sup> busiest metro in Europe
- .Serves 1.5 million people daily
- .620 million annually
- .First lines running in 1974
  
- .Soviet E-Series trains
- .81-71m train replacement

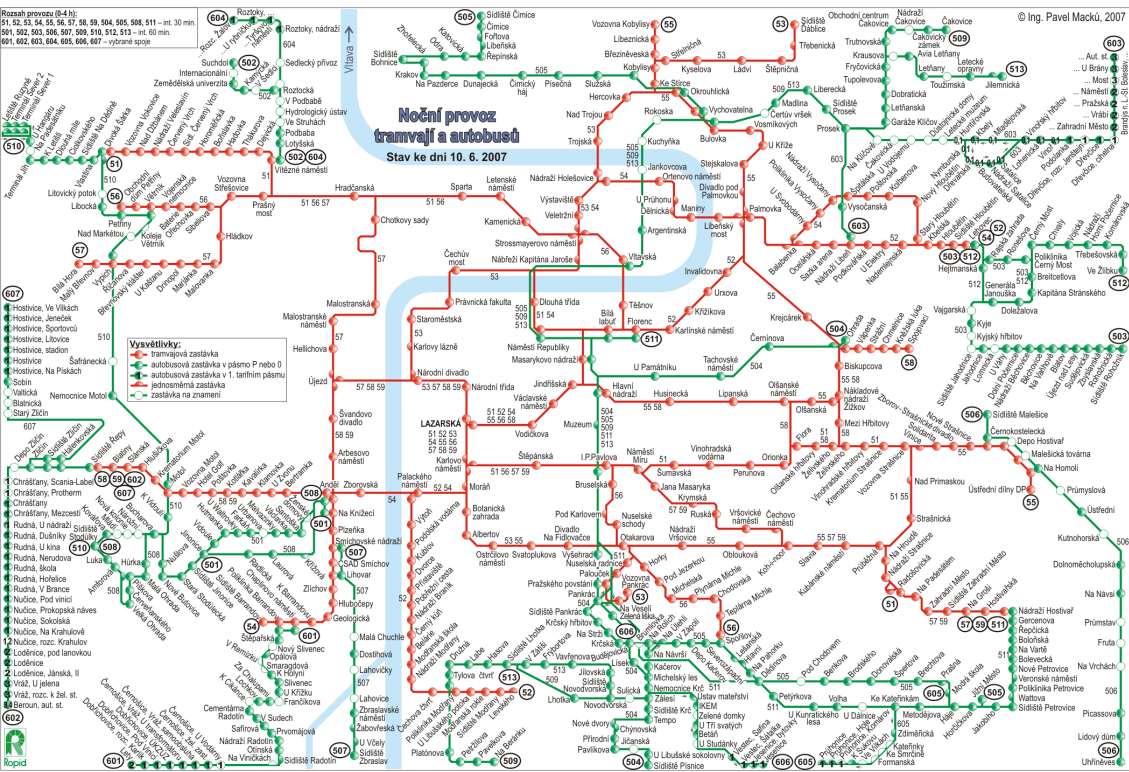
- .Siemens M1
- .Continued extension of lines
- .Station floods in 2002



# Prague Public Transit

## • Tram System

- 140 km of track
- Over 900 tram cars
- 33 lines in total
- Total route length 540 km
- Originally horse car in 1875
- First electric trams in 1891
- Daily ridership 980,000
- Original Tatra T3 cars
- Škoda 14 T
- 1980's Tram Expansion
- CKD Tatra Bankruptcy
- High demand for Škoda Trams



# Prague Public Transit

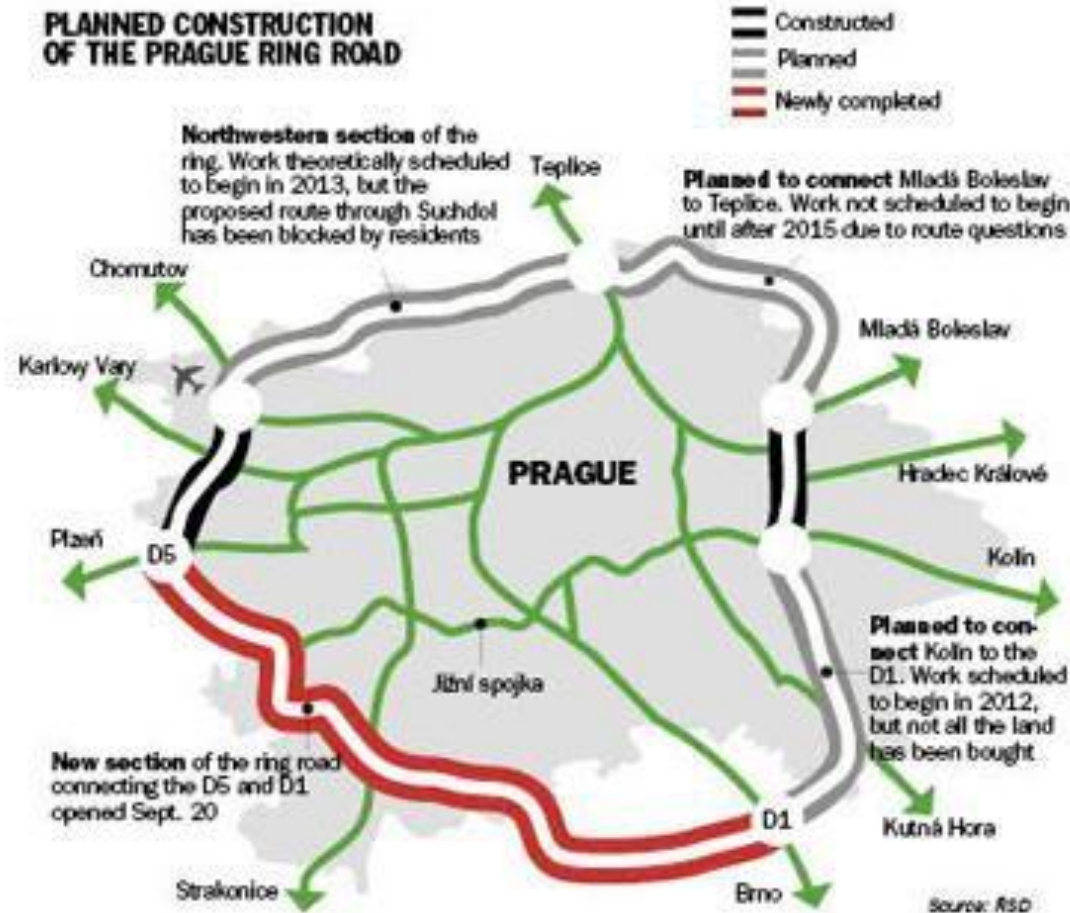
- Bus System
- Experimentally started in 1908
- Continuous Service since 1925
- Still mostly Diesel powered vehicles
- Skoda/UJV Nuclear/Proton motor project
- Potential Hybrid bus system
- Huge energy savings



# Prague Ring Roads:

- 23 km of New roadways surrounding city
- 22 billion Kč
- Diverting 50% of truck traffic and 30% of automobile traffic
- Reducing traffic and exhaust fumes
- Faulty Bridge construction
- Expansion of ring roads to northern area of Prague
- Expensive construction

# Prague Ring Roads



# Reducing City Pollution in Prague

- **Maintaining Public transportation**

- City wide efforts to maintain appeal for using trains/trams
- Reducing dirt and dust accumulation in metro stations
- Keeping public transportation safe

- **Automotive Emissions**

- Setting standards for exhaust emissions

- **Public Transportation Campaigning**

- Advertising aiming to increase use of public transportation
- Increase “car pooling”
- Reduce individual car ownership
- Install “Park and Ride” systems for commuters

# Munich Public Transit

- Munich U-Bahn
- 6 different lines
- 91 km of active lines
- 98 stations
- 330 million passengers annually (2006)
- Daily ridership 904,110
- Over 550 trains currently
- Have used electric trains since 1967
- Operate at speeds up to 80 km/hr
- Class A, B, C trains

# Munich Public Transit

- Munich Tramway

- 11 lines
- 155 stations
- Daily Ridership 250,000 (2007)
- Transported 94.5 million people in 2009
- Initially established as a horse car
- Electric trams were introduced in 1895

Note: in March of 2010, USA Today reported that a survey by EuroTest on local public transport in Europe had declared the Munich system to be the best in Europe.

# DC Public Transit

- **Metrorail**
  - 5 lines, 86 stations
  - Estimated daily ridership of 1,044,400
  - Line length covers 171 km
  - 3 interchange stations within city center
  - Plans for future additions: Addition of Silver Line,
- **Metrobus**
  - 319 routes
  - 1,480 bus fleet
    - 25% hybrid
    - 30% compressed natural gas
    - 8% advanced tech clean diesel
    - 37% standard diesel
  - Daily ridership average at about 439,424

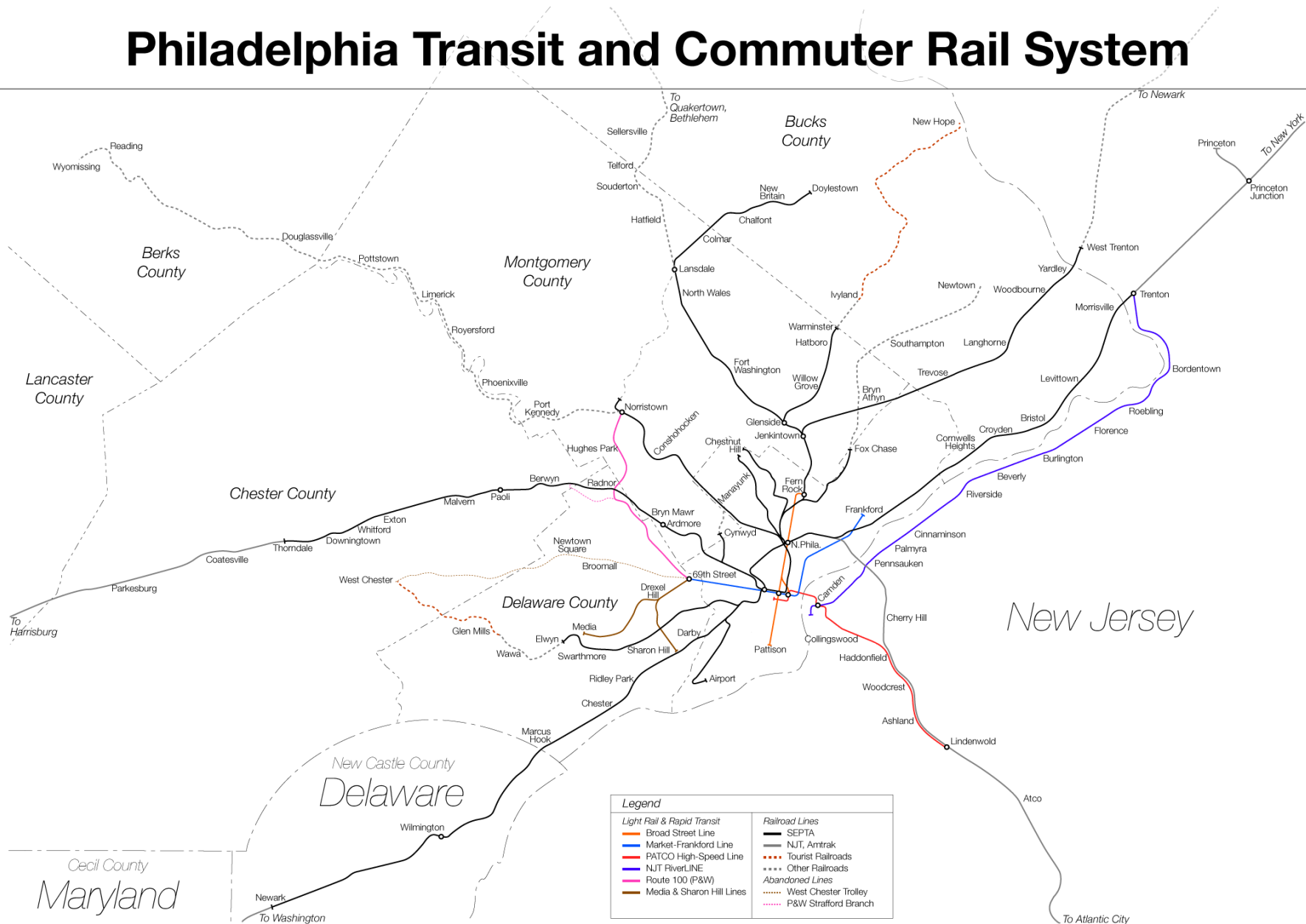
Serves a DC Metropolitan Area population of 5.4 million



# Philadelphia's SEPTA

- 196 routes total
- 280 stations
- 2,295 revenue vehicles
- 724 km total system length
- Annual ridership: 320,984,300
- Includes bus, subway and elevated rail, commuter rail, light rail, and trolley systems
- Services Greater Philadelphia metropolitan area population of 5.8 million

# Philadelphia Transit and Commuter Rail System



Legend	
<b>Light Rail &amp; Rapid Transit</b>	<b>Railroad Lines</b>
— Broad Street Line	— SEPTA
— Market-Frankford Line	— NJT, Amtrak
— PATCO High-Speed Line	— Tourist Railroads
— NJT RiverLINE	— Other Railroads
— Route 100 (P&W)	— Abandoned Lines
— Media & Sharon Hill Lines	— West Chester Trolley
	— P&W Stratford Branch

# Improving Systems in place

Aside from expanding on the capacity of heavy and light rail offerings, improvement focus should be placed on buses as a means of moving away from heavily carbon-emitting vehicles

- Example of DC WMATA: WMATA Clean Fleet Projects designed for a large scale shift to cleaner technology.
  - Improved fleet efficiency and decreased diesel fuel dependence by 35% in nine years.
  - For WMATA fleet, diesel-run buses have most expensive operating cost per mile, while hybrids are cheapest, most fuel efficient.
- Going further: investing in fully electric vehicles with regenerative braking systems
- Cheaper improvements: design innovation for trolleys and buses
  - adding solar panels, retrofitting windows for better insulation

On the whole, the problem with American mass transit systems is that, with the exception of NYC, people are content to rely on cars. The question then becomes: how do you encourage wider utilization of these systems?

# The Energy Problem

- Biggest improvements to existing transit systems lie in where they draw energy from.
  - Longer term issue
- An understanding of the natural resources in the region around the system is essential.
  - Coastline: Consider harnessing wind and tidal energy via windmills, underwater kites
  - Inland: Geothermal energy, Nuclear, etc
  - Plains: Windmills, solar

**The case of Czech Republic: landlocked nature means easiest answers lie in nuclear, geothermal**

- Nuclear improvements over time have made it a safe and clean option, especially if investing into thorium reactors. Problem is planned decrease in Uranium mining and unknown

**In the meantime, look for short term solutions to improve existing coal plants, like coal scrubbers.**

# Minimizing Carbon Emissions: Smarter Use of the Roads

- Carrot and stick methods
- Eliminate on-street free parking
  - Money gained through parking meters can be invested in green energy
  - Decreases incentives to use a car
- Implement city bike share programs
- Subsidize taxi companies upgrading fleets to more fuel-efficient vehicles
- Offer tax refund credits good for varied amounts
  - bike users, hybrid/electric owners, carpoolers
- Create new tax for car owners within the city
  - Tax rates can depend on a car's MPG
- Begin closing off certain roads from automotive traffic
  - Slow, multi-tiered process
  - Start with low-congestion streets, build towards only having major traffic intersections remaining open

# The Commuter Problem

- Several cities receive high automotive traffic from commuters, a byproduct of suburban sprawl.
- Push towards public transit use: expand subway, tram lines to reach into the suburbs
  - Prague Metro working on this; SEPTA already has a functioning example of commuter rail
  - Work with suburban communities to develop light rail plan simplify travel needs for commuters
  - Carpoolers
- Charge car drivers tolls for entry into city limits
  - Can be based on car MPG
  - Announced years in advance, further encouraging the purchase of cars with better MPG for those looking to buy a new car

# Summing Up

Existing public transit systems in both Europe and the United States are functional and fairly carbon-efficient. Certain changes can be made down the line in order to further increase the effectiveness of metropolitan mass transit; however, the main focus should be on the push towards more popular use of these systems, especially in the United States. Wider acceptance and usage of public transit will help establish a city more suited for higher population density, can reduce the need for suburban sprawl, and will decrease the size of humanity's carbon footprint.