NASTO Québec 2016

Transportation Technology

- **Allen Biehler** *Carnegie Mellon University*
- **Michael Cammisa** *Association of Global Automakers*
- **Susan Martinovich** *CH²M*
- **Jean-Francois Barsoum** *Smarter Cities IBM*

Carnegie Mellon University

traffic21
a transportation research institute of Carnegie Mellon University

Technologies for Safe and Efficient Transportation
A U.S. DOT UNIVERSITY TRANSPORTATION CENTER
Carnegie Mellon University
University of Pennsylvania

NASTO Québec 2016

Connected and Automated Vehicles

Transformation in Mobility

Allen Biehler

June 6, 2016

Major Transportation Changes

- ✓ Personal car
- ✓ Zipcar – internet, wireless technology + on-line payment
- ✓ Real-time knowledge of all modes – seamless connectivity
  - ubiquitous smart phones
  - collaboration of people
  - data assets
  - technology platforms

Microtransit

Commuter buses

- ✓ **Leap Transit** or **Chariot** in San Francisco
- ✓ **Bridj**

Personal cars as taxis

- ✓ **Lyft**
- ✓ **Uber**

Dynamic vanpools

- ✓ **Via** in New York.

Company shuttles

- ✓ **Google bus**

Microtransit

Commuter buses

- ✓ **Leap Transit** or **Chariot** in San Francisco
- ✓ **Bridj**

Driverless

Personal cars as taxis

- ✓ **Lyft**
- ✓ **Uber**

Dynamic vanpools

- ✓ **Via** in New York.

Company shuttles

- ✓ **Google bus**

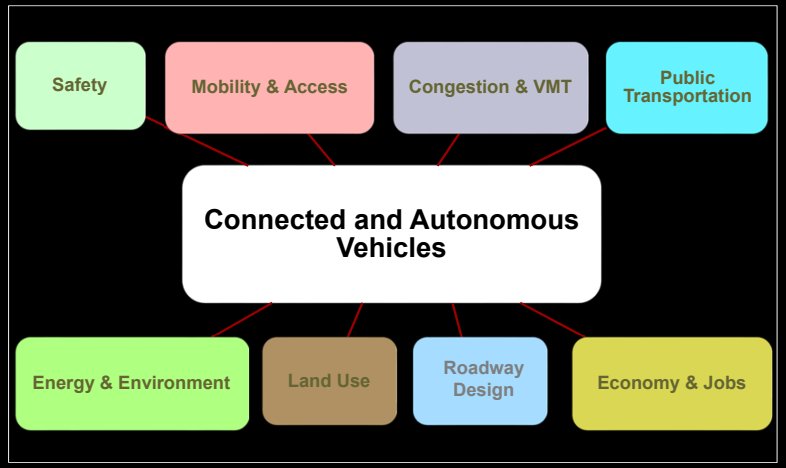
When?

- ✓ Driverless cars by 2020
  (Cadillac, Tesla, Google, Volvo, Audi, Mercedes-Benz and Nissan)
- ✓ Fully driverless vehicles by 2025
  (Boston Consulting Group)
- ✓ Driverless trucks and cars by 2026-2030
  (European Road Transport Research Council)

Automated Vehicle Issues

- ✓ Technical
- ✓ Regulatory
- ✓ Operating
- ✓ Policy

Policy Issues



Only 6% of big US cities are planning or thinking about automated vehicles.

National League of Cities

Only 6% of big US cities are planning or thinking about automated vehicles.

Smart Cities Challenge

National League of Cities

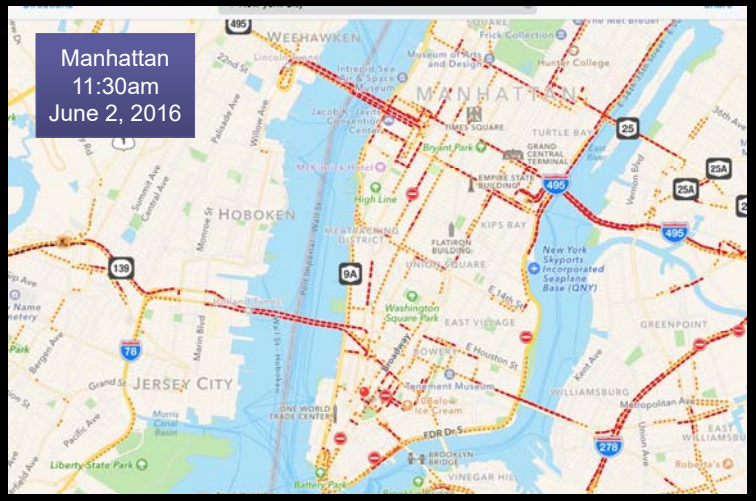
Big issues

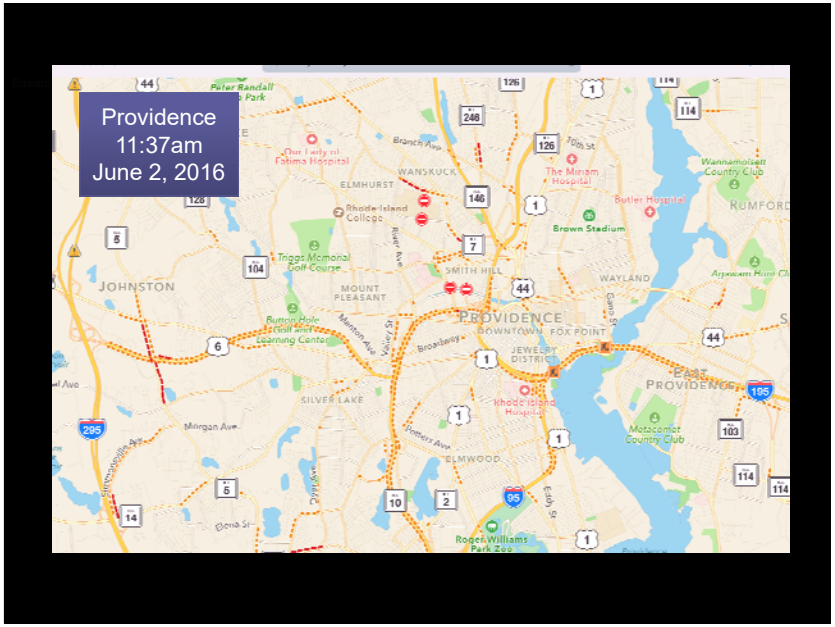
- ✓ Death toll nearly 3,000/mo. in US
- ✓ $230 billion in annual accident cost

- ✓ 30% of urban land in US devoted to parking and roadways

Big issues

- ✓ 50 billion gallons of gasoline imported
- ✓ Cars & trucks produce 80% of transportation carbon emissions
- ✓ By 2050, there could be 10 million more vehicles in US urban areas

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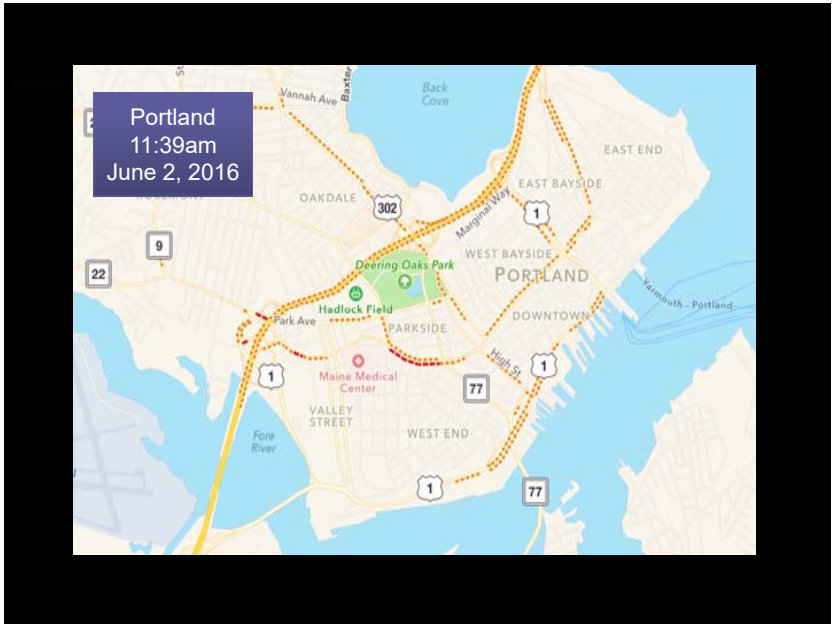
June 2, 2016
PROVIDENCE
JOHNSTON
EAST PROVIDENCE
WAYLAND
SILVER LAKE
ELMWOOD
Brown Stadium
Roger Williams Park Zoo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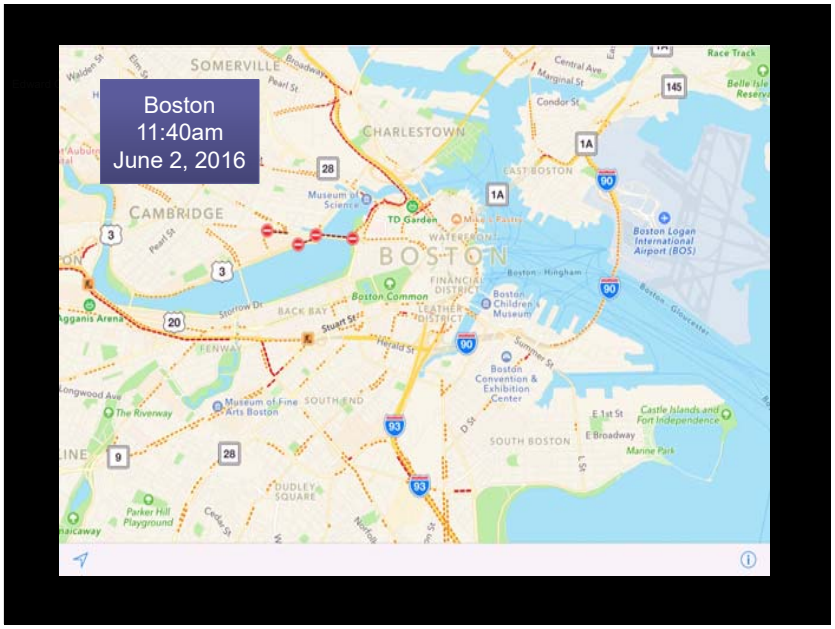
PORTLAND
OAKDALE
EAST BAYSIDE
WEST BAYSIDE
EAST END
DOWNTOWN
PARKSIDE
WEST END
VALLEY STREET
Deering Oaks Park
Hadlock Field
Maine Medical Center
Back Cove
Fore River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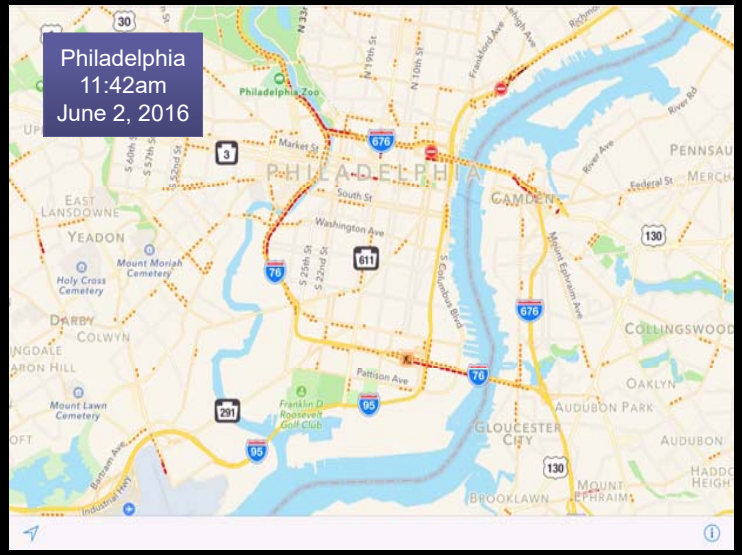
SOMERVILLE
CHARLESTOWN
CAMBRIDGE
BOSTON
EAST BOSTON
SOUTH BOSTON
SOUTH END
BACK BAY
FENWAY
TD Garden
Boston Common
Boston Logan International Airport (BOS)
Boston Convention & Exhibition Center
Boston Children's Museum
Museum of Fine Arts Boston
Castle Islands and Fort Independence
Race Track
Belle Isle Reserv
Parker Hill Playground
DUDLEY SQUARE
Marine Park
The Riverway
Storrow Dr
Stuart St
Herald St
Summer St
Central Ave
Condor St
Pearl St
Broadway
E Broadway
E 1st St
Boston - Hingham
Boston - Gloucester
1A
90
93
145
28
3
20
9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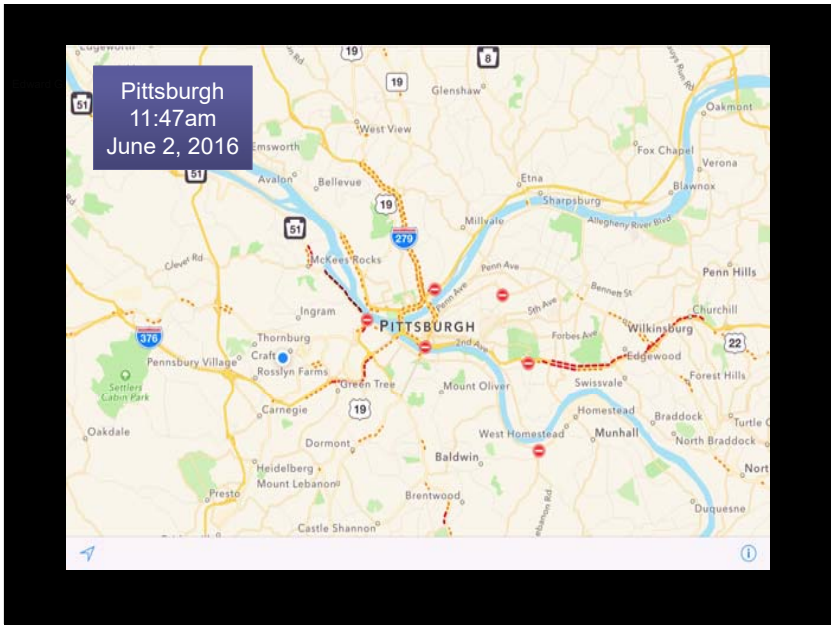
PHILADELPHIA
CAMDEN
EAST LANSDOWNE
YEADON
DARBY
COLWYN
OAKLYN
AUDUBON PARK
AUDUBON
GLOUCESTER CITY
BROOKLAWN
COLLINGSWOOD
PENNSAUKEN
Philadelphia Zoo
Mount Moriah Cemetery
Holy Cross Cemetery
Mount Lawn Cemetery
Franklin D. Roosevelt Golf Club
Market St
South St
Washington Ave
Pattison Ave
Federal St
River Rd
River Ave
Mount Ephraim Ave
Industrial Hwy
30
3
676
76
611
95
291
130


Pittsburgh
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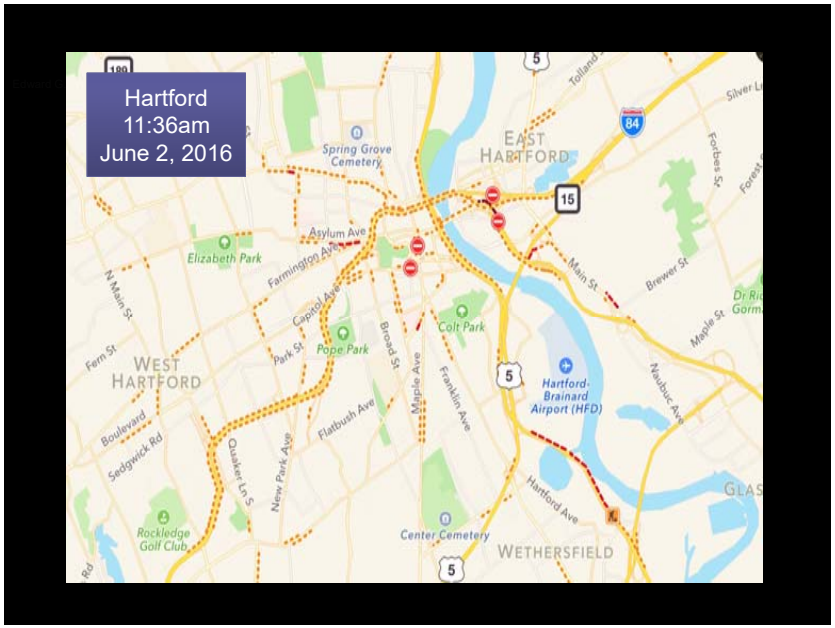
PITTSBURGH
Glenshaw
West View
Oakmont
Fox Chapel
Verona
Avalon
Bellevue
Etna
Sharpsburg
Millvale
Blawnox
McKees Rocks
Penn Hills
Ingram
Churchill
Thornburg
Craft
Wilkinsburg
Pennsbury Village
Rosslyn Farms
Green Tree
Mount Oliver
Swissvale
Edgewood
Forest Hills
Carnegie
Homestead
Braddock
Oakdale
Dormont
West Homestead
Munhall
North Braddock
Baldwin
Heidelberg
Mount Lebanon
Presto
Brentwood
Duquesne
Castle Shannon


Hartford
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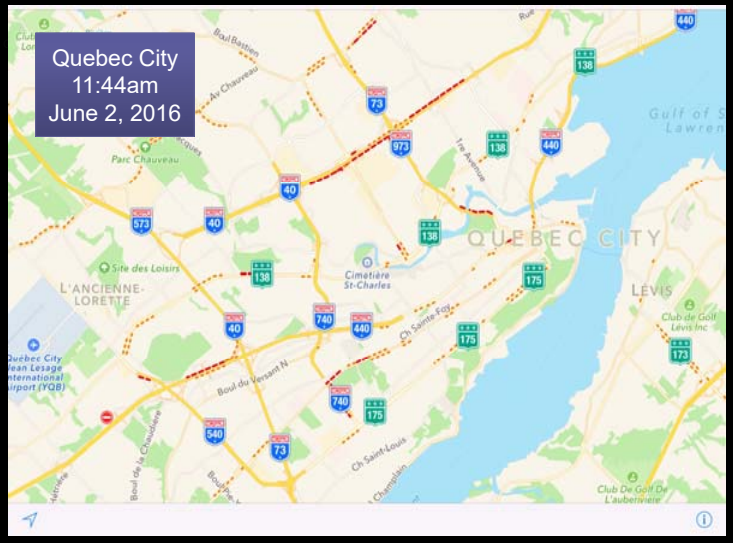
June 2, 2016
EAST
HARTFORD
Spring Grove
Cemetery
Asylum Ave
Elizabeth Park
Farmington Ave
Capitol Ave
Colt Park
Pope Park
Park St
Broad St
Maple Ave
Franklin Ave
Main St
Brewer St
N Main St
Fern St
WEST
HARTFORD
Boulevard
Sedgwick Rd
Quaker Ln S
New Park Ave
Flatbush Ave
Hartford-
Brainard
Airport (HFD)
Hartford Ave
Rockledge
Golf Club
Center Cemetery
WETHERSFIELD



Potential Outcomes

- ✓ One *shared autonomous vehicle (SAV)* could replace 9 conventional vehicles (Kockelman et al, University of Texas)
- ✓ SAV's in cities could result in one-fifth the number of cars (Carlo Ratti, SENSEable City Lab, MIT)
- ✓ SAV's could reduce traffic or make cars cheaper and increase traffic (Marshall Brown, Illinois Institute of Technology)

Potential Outcomes

- ✓ Driverless technology will facilitate electric vehicles.
- ✓ More affordable housing if reduce parking requirements.
- ✓ More independent mobility for people with low incomes.

"Stop adding highway lanes and more parking lots. Instead build ideal driverless urban environment"

(Gabe Klein)

Actions to Consider

- ✓ Roadway design
  - o Narrower lanes and cartways
  - o Special lanes for driverless vehicles
  - o Curbside design for heavier pick-ups & drop-offs
  - o Pedestrian and bicycle safety design
  - o Eliminate curbs

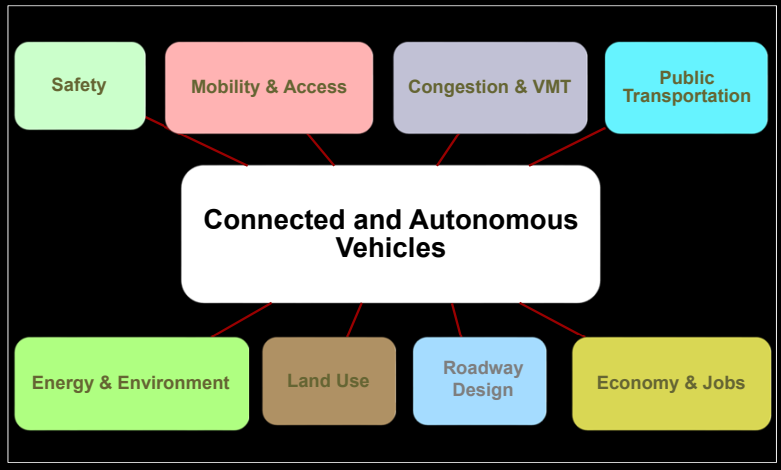
Actions to Consider

- ✓ Parking
  - o Reduce or eliminate on-street / off-street parking
- ✓ Transit
  - o Continue investment in fixed-route, fixed guideway
  - o Accommodate microtransit providers
    - ▪ Stop and station design
    - ▪ Service integration

Actions to Consider

- ✓ Urban design
  - Consider driverless car pockets within cities.
  - Capture up to 90% of urban land devoted to roadways and parking.
  - Lower or eliminate parking requirements for developments.

Policy Issues




Huge Collaboration Opportunity