Smart Transportation in a Smart City

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Definition of a Smart City

- "An instrumented, interconnected, and intelligent city"
  - IBM’s Journal of Research and Development
- "A smart city uses information and communications technology to enhance its livability, workability, and sustainability."
  - Smart Cities Council
- "Eight key aspects that define a Smart City: smart governance, smart energy, smart building, smart mobility, smart infrastructure, smart technology, smart healthcare and smart citizen."
  - Sarwant Singh in Forbes
Smart Solutions

E-Governance and Citizen Services
1. Public Information, Grievance Redressal
2. Electronic Service Delivery
3. Citizen Engagement
4. Citizens - City’s Eyes and Ears
5. Video Crime Monitoring

Waste Management
6. Waste to Energy & fuel
7. Waste to Compost
8. Waste Water to be Treated
9. Recycling and Reduction of C&D Waste

Water Management
10. Smart Meters & Management
11. Leakage Identification, Preventive Maint.
12. Water Quality Monitoring

Energy Management
13. Smart Meters & Management
14. Renewable Sources of Energy
15. Energy Efficient & Green Buildings

Urban Mobility
16. Smart Parking
17. Intelligent Traffic Management
18. Integrated Multi-Modal Transport

Others
19. Tele-Medicine & Tele Education
20. Incubation/Trade Facilitation Centers
21. Skill Development Centers

- Smart Cities Mission
Smart Mobility as Part of an Integrated System

• A smart city requires a system-wide and an integrated cross-departmental approach
  – A system of systems
  – Integrated services

• Examples
  – Transportation depends on power and communications
  – Emergency services need real time travel condition information and optimization of signals
What Are We Trying to Achieve with Smart Cities

• Livability
  – Reducing traffic and congestion
  – Reducing trip time
  – Empowering people with choice and control
  – Improving public safety

• Workability
  – Increasing cities competitive advantage
  – Becoming more attractive to talent

• Sustainability
  – Reducing pollution from transportation
  – Improving transportation budgets

- Smart Cities Council
A Smart City Is Built Around Data

• Collection of data
  – Dependent on thousands and even millions of sensors
• Communication of data
• Analyzing data to turn it into information that is actionable
• Predicting what will happen next
• Communication of information
Elements of Smart Transportation in a Smart City

• Mobility as a service
  – Transportation network companies (e.g., Uber, Lyft)
  – Car sharing
  – Bike sharing
  – Ride sharing apps
  – Pop up transit systems (e.g., Bridj)
  – Multi-modal trip planning apps
  – Real time transit status apps
Elements of Smart Transportation in a Smart City

• Increased efficiencies of operations
  – Advanced traffic management systems to optimize traffic flow
  – System-wide incident detection and reporting
  – Multi-modal operational optimization
  – Rerouting of vehicles and passengers
  – Dynamic demand-based pricing
  – Adaptive traffic signal systems
  – Signal priority for transit
  – Signal priority for emergency responders
Elements of Smart Transportation in a Smart City

• Traveler information systems
  – Real time multimodal travel time information
  – Information on alternative modes and travel times
  – Dynamic rerouting information during trips
  – Real time transit status information
  – Real time weather information
  – Real time parking information

• Multimodal payment systems
  – Multimodal fare cards (e.g. taxis, TNCs, transit, tolls)
  – Payments of transit fares with mobile phones
Elements of Smart Transportation in a Smart City

• Smart parking management systems
  – Real time information on parking availability and pricing

• Electric vehicles
  – Charging stations
  – Electric buses (e.g. Gothenburg, Sweden)

• Lighting systems
  – LED lights and signals
  – Motion sensitive street lights

• Asset management systems
Future Elements of Smart Transportation in a Smart City

• Connected and automated vehicles
  – Data communicated to vehicles from signals
  – Autonomous buses (e.g. CityMobil2)
  – Shared driverless vehicles (Uber pilot)
  – Potential for first mile, last mile to transit

• Unmanned aerial systems (a/k/a drones)

• Goods movement
  – Small scale and environmentally friendly deliveries (e.g. Gothenburg)
  – Unmanned aerial systems
“Helsinki's ambitious plan to make car ownership pointless in 10 years”

“Finland's capital hopes a 'mobility on demand' system that integrates all forms of shared and public transport in a single payment network could essentially render private cars obsolete.”

- The Guardian
Helsinki’s Ambitious Plan

• Helsinki’s goal is a point-to-point “mobility on demand” system by 2025 that will serve as both a journey planner and universal payment platform.
• People will be able to purchase mobility in real time, straight from their smart phones.
• “The hope is to provide riders with an array of options so cheap, flexible, and well coordinated that it becomes competitive with private car ownership not just on cost, but on convenience and ease of use.
• … knitting everything from driverless cars and nimble little buses to shared bikes and ferries into a single, supple mesh of mobility.”

- The Guardian
Helsinki’s Experiments with Transit

- The economics for Kutsuplus, a point-to-point minibus service, did not work out.
- Helsinki is now trying self-driving buses for feeder service to mainline routes, EasyMile EZ10.
Issues to Think About

• Data sharing with private service providers
• Extent and cost of sensors required
• How to partner with TNCs to help, rather than hurt transit
• Impacts of autonomous vehicles on transit
• The role of municipal government vs. the private sector in providing services
• A regulatory environment that supports smart transportation while ensuring safety
Issues to Think About

• Unintended consequences (e.g. zero occupancy vehicle VMT)
• Cybersecurity issues
• Privacy issues
• Equity issues
  – Those who do not own cellphones
  – Will services be only be affordable by the well to do?
  – Ensuring equal access for the elderly and disabled
• How Smart Mobility can be an be integrated element of a comprehensive Smart City initiative
State-of-the-Activities TRB e-Circular (May 2016)

- Connected/automated vehicles
- Shared-use services
- Unmanned aerial systems
- NextGen
- Big data/cybersecurity
- Smart Cities/Internet-of-Things
- 3D Printing
Transformational Technologies in Transportation
Partners in Research Symposium
October 31-November 1
Detroit, Michigan
Co-sponsored by Michigan DOT and NCHRP
2017 TRB Annual Meeting

Jan. 8-12, 2017

Washington DC

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