Trends in Transportation:
The Future of GIS in Smart Transportation

Terry Bills
Current Trends in Transportation

*Change and Disruption*

- Decline in Auto Ownership by Millennials
- New Means of Transport (Transportation Network Companies - TNCs)
- Growth (but also dissatisfaction) in Public Transport
- Increasing Congestion in Cities
Smart Cities Challenge
Requires Solving our Transportation and Mobility Issues
Opportunities in Transportation
To Address Change and Disruption

• New Data Sources to Better Understand Mobility Patterns

• Big Data Analytics and Spatial Analysis

• Breaking Down the Silos

• “Smart Cities / Smart Transportation”
New Data Sources

Leveraging Cellular Data for Travel Information

- AirSage Cellular Tracking Data

Citilabs Streetlytics Demographic data
New Data Sources

Leveraging Cellular Data for Travel Information

SafeGraph
New Data Sources
Leveraging Cellular Data for Travel Information

- Twitter Posts
- Indoor (Bus) Tracking with Wi-Fi and Bluetooth

"We are just beginning to understand how we can use the technology for understanding consumer behavior."

Josh Kavagh U of Washington
New Data Sources
Leveraging Cellular Data for Travel Information
New Data Sources

Leveraging Traffic Cameras for Real Time Counts and Speed Data

“MetroTech converted our traffic cameras into 24 x 7 count stations, providing us with enhanced traffic data. From this data, we were able to improve our signal timing, mitigating overall congestion.”

Ananth Prasad Senior Civil Engineer County of Santa Clara
Leveraging Crowd Sourcing

Every Citizen is a Sensor

Waze Partnership
Understanding Big Data

- Sensor Information and Big Data: generating massive amounts of data

- Three V’s of Big Data: Volume, Velocity and Variety: the sheer amount, the speed, and the different types of data

- Magnifies the problem of understanding and context
Smart GIS Embeds Advanced Analytics and Visualization
Providing a System of Insight

Big Data GeoAnalytics

Interactive Exploration

Spatial Analysis & Geoprocessing

Web GIS

Enabling Smarter Transportation
Real-Time

Integrating Sensor Networks and the IoT

- High-Velocity Data Streams
- Monitoring and Alerting
- Dynamic and Big Data Analytics

Supporting Real-Time GIS Applications . . . Enabling Smarter Organizations
Big Data Analysis
Big Data Trends
Leveraging GIS and Big Data Analysis
Everything is Driven by Location

Connected Vehicles

Parking Fees and Management

Car Insurance

Toll Collection Systems
Mobility
Transit Accessibility

“As states and regions strive to put Americans back to work, policymakers should be careful not to sever the transportation lifelines between workers and jobs.”

Missed Opportunity: Transit and Jobs in Metropolitan America

Findings:
- An analysis of data from 23 transit providers in the nation’s 25 largest metropolitan areas finds that:
  - Nearly 75 percent of large metropolitan residents live in neighborhoods with access to
    transit service in less than 90 minutes. Transit coverage is highest in Western metro areas such as
    San Francisco and Los Angeles, and lowest in Southeastern metro areas such as Charlotte and
    Atlanta.
  - Many residents of large metro areas rely on transit as their primary mode of travel, especially
    those who are unable to drive or who live in areas with poor road infrastructure.
  - In metropolitan areas with high levels of transit coverage, more residents use transit to
    commute to work, attend school, and access other amenities.
  - The bus mode is the most widely used for daily commutes in large metro areas.
  - The number of residents who use transit for daily commutes has increased in recent years.

Metropolitan Transit Access: Coverage

Share of working-age population within 90 minutes of a transit stop

- Metropolitan Transit Access: Coverage
  - Share of working-age population within 90 minutes of a transit stop
  - Coverage
  - Service frequency
  - Trip access
  - Metrorail

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Transit Accessibility
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AM Transit Trip Duration from Orange Metrolink Station

Trip Duration (minutes):
- 0 - 10
- 10 - 20
- 20 - 30
- 30 - 45
- 45 - 65

No. of Employees:
- 150 - 250
- 251 - 1,000
- 1,001 - 2,000
- More than 2,000

Transfers:
- 2
- No Access

Orange Station

Source: OCTA

OCTA
Performance Monitoring
Real Time Performance Monitoring: Spain
Real Time Data: Madrid
Real Time Data: Finland
Real Time Data: Abu Dhabi
Mobility as a Service (MAAS)

Change and Disruption

Maas, short for Mobility as a Service, brings all means of travel together. It combines options from different transport providers into a single mobile service, removing the hassle of planning and one-off payments.

Maas is a sustainable, environmentally sound alternative to owning a car. It works out the best option for every journey — whether that’s a taxi, public transport, a bike, or a walk. Wherever you need to go, Maas will manage your daily travel in the most efficient way possible.

For extra convenience, Maas can include value-added services like deliveries for groceries or restaurant meals. It allows people to go places and live their lives without more time than ever before.

The world’s first ever Maas solution, MaasX, was launched in Helsinki Region at the end of 2016, and more areas will follow in 2017.
Breaking Down The Silos
Breaking Down the Silos
Breaking Down the Silos

Making Auckland the World's Most Livable City

Our Vision:
The World's Most Livable City

- Fair, Safe and Healthy
- Green
- Prosperity and Opportunity
- Connected and Accessible
- Culturally Rich and Creative
- Beautiful and Loved
- A Maori identity
Breaking Down the Silos
GIS for Smart Cities: San Francisco

1. URBAN CONTEXT

These maps represent the physical and regulatory context of the city. Click on the buttons below to see the city in various ways.

Traditional maps were 2-dimensional and static, representing a limited view. Now in time:

**Traditional 3D Map**

Dynamic, 3-dimensional views allow you to "reach up" visual information to see the city in a new way. These buildings represent the city schematically and make a good basis for visualizing information.

**3D Schematic View**

These buildings represent the city realistically and help provide a sense of place -- the feeling of understanding a real place, even if virtually.

**3D Realistic View**

Volumetric city height districts can be shown along with realistic buildings.

**Current Height Districts**

Volumetric current land use can be visualized on the buildings themselves.

**Current Land Use by Building**

2. UNDERSTANDING GROWTH CAPACITY

Understanding growth capacity at the neighborhood scale is important. At the neighborhood scale, by transportation analysis zone, and by parcel. It's easier to see patterns when the data is represented this way. From this tool, we can see the number and distribution of (X)ZD.

**Transportation Analysis Zone (500)**
San Francisco: Transit Accessibility

4. UNDERSTANDING GROWTH CAPACITY AND TRANSIT SERVICE

San Francisco is currently served by three high-capacity transit systems: BART (subway rail), Caltrain (commuter rail), and Muni Metro (light rail). With the proposed addition of Bus Rapid Transit (BRT) service to Hunter’s Point, Candlestick Point, and along key city links, most of the city will be served by high-capacity transit.

High Capacity Transit Workhores
Transit Accessible Housing
Transit Accessible Jobs
San Francisco: Designing High Capacity Public Transit

4. UNDERSTANDING GROWTH CAPACITY AND TRANSIT SERVICE

San Francisco is currently served by three high capacity transit systems: BART, Caltrain, and the San Francisco Municipal Railway (Muni). With the planned addition of the Dub Rapid Transit (DRT) service to Hunters Point / Candlestick Park, along with future BART West, most of the city will be served by high-capacity transit.
City of Los Angeles
Is Already Implementing a Community GIS

Solutions Cross Departments
Expanding Their GIS to Support Everyone
Smart Cities

Los Angeles Vision Zero

Vision Zero is a global initiative whose goal is to reduce severe injuries and deaths in roadway collisions. This is achieved by using a multi-pronged approach that includes engineering, education, enforcement, and public health strategies.

Vision Zero Maps & Applications

- High Injury Network
  - This Story Map explores the High Injury Network in relation to health indicators and other traffic management strategies and planning efforts.

- Vision Zero: A Data-Driven Approach
  - A walk through of Los Angeles’ data-driven approach to Vision Zero.

- Vision Zero Los Angeles
  - The plan to eliminate traffic fatalities in the City of Los Angeles by 2028.

- Collision Landscape in Los Angeles
  - Identifies hotspots of total and severe crashes, involving collisions on major streets in Los Angeles.
Open Data – Mobility Options
Smart GIS Enables New Types of Collaboration

Connecting Individuals, Organizations and Communities

...Creating a Nervous System for Our Planet