Performance Measures & Big Data

Catherine Manzo
StreetLight Data
catherine.manzo@streetlightdata.com
Agenda

I. What Big Data Can Be Used to Evaluate Performance Measures?

II. Case Studies
   I. Environmental Sustainability
   II. Freight Movement & Economic Vitality
   III. Accessibility

III. Q&A
Poll: Show of Hands

Have you evaluated performance measures with an empirical data source?
Location Data from Mobile Devices and Navigation-GPS Can Show When, Where, and How People Move

**Key Benefits**

- Accurate
- Precise
- Comprehensive
- Anonymous

Note: This image shows a filtered subset of data to improve visibility. The data is from September 2016 in Fremont, CA.
What Big Data Are We Working With?
Mobile device data from ~23% of US and Canadian adults and ~12% of commercial truck trips
Video shows a subset from Oct 8th, 2017 in San Bernardino, California
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This Messy Geospatial Big Data Can Be Processed into Trips and Travel Patterns
How Can Big Data Be Used to Evaluate Performance Measures?

- Geospatial Data
- Calibration Data
- Road Network
- Parcel/Land Use Data
- Demographic Data

Cloud Computing + Infrastructure

Cloud-Based Software Platform

Machine Learning + Algorithmic Processing

Big Data + Contextual Data

Metrics
- 2016 AADT
- Origin-Destination
- Select Link
- Commercial Trips & More

Project Performance Measurement

Budget Allocation

Equity and Accessibility Studies

Air Quality / GHG Estimation

Project Prioritization

Active Transportation Planning

Freight Modeling

Public Engagement

Corridor Studies

Internal/External Studies

Complete Streets

Transit Planning

Congestion Busting

Travel Demand Management

Travel Demand Modeling & Forecasting

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Project Prioritization

Public Engagement
Case Studies
Measuring Environmental Sustainability

With Vehicle Miles Traveled Derived from Big Data
Vehicles Miles Traveled is a good metric to track over time, to see if behavior is moving in the right direction.

Cities and also places like Universities can now measure this quickly.
A simple VMT calculation can be obtained....

A. Calculate the average volume of vehicle visits going to or coming from the area of interest (i.e. The Ohio State University campus) on a daily basis

B. Calculate the average trip length of trips that start and stop at the area of interest

\[ VMT = \text{Average Daily Traffic} \times \text{Average Trip Length} \]
For the 2017 – 2018 School Year, the average trip length for trips ending within the boundaries is 7.7 miles. But, this ends up being 1,130,014 vehicle miles traveled across all trips.
Measuring Freight Movement and Economic Vitality

With Commercial Truck Big Data
Parsons Ave passes through a few industrial areas, including a CSX railway facility.

I analyzed Speed and Travel Time of SB and NB Truck Traffic.
For south bound traffic, the slowdown appears during the midnight to 6am time period.
During the 6am – 10am hours, truck travel moves more quickly through the corridor.
Measuring Accessibility

With Corridor Reliability Derived from Big Data
First, I identified top destinations for people in the AM peak hours leaving Central neighborhood.
Next, I calculated the distribution of travel time between Central neighborhood and the top two destinations.

**Distribution of Travel Time on a typical weekday, anytime during the day**

O-D Traffic (StL Index) %

![Chart showing distribution of travel time]

- Distribution is represented in percentage ranges for different time durations:
  - 0-5 min
  - 5-10 min
  - 10-20 min
  - 20-30 min
  - 30-40 min
  - 40-50 min
  - 50-60 min
  - 60+ min

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*Proprietary and Confidential*
Average travel times appear to decrease for one destination but increase for the other

Distribution of Travel Time on a typical weekday, AM Peak (6am – 10am)
Thank you!
Questions?

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