

BIG DATA EVALUATION: PRELIMINARY RESULTS

Framework for Evaluating Big Data in Regional Travel and Mobility Analyses

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Framework for Evaluating Big Data in Regional Travel and Mobility Analyses

- Conduct an independent evaluation of Big Data and its use and limitations in regional travel and mobility analyses and modelling
- With processing and analytics tools, **Big Data can illustrate patterns and trends in human behavior and activity**
- Big Data sources with transportation planning applications include passively collected data from mobile applications, including GPS traces and location-based services, on-board vehicle sensors, traffic sensors and cameras, unmanned aircraft/space-based radar used to monitor traffic flow, and smart card data, among others



Scope

1. Establish Study Work Group (membership, responsibilities, and meeting schedule) and study work plan
2. Develop understanding of TPB programmatic requirements and analytical/modelling processes
3. Review state of the practice of Big Data use and applications by other MPOs
4. Conduct an independent evaluation of Big Data sources for their potential in supporting TPB staff in meeting its programmatic requirements
5. **Recommend options and considerations for acquiring Big Data**
6. Prepare a final report



Research Considerations

The research areas specifically considered as part of this evaluation consist of eight (8) general categories:

1. Travel Demand Forecasting (TDF)
2. Transit and Non-Motorized Travel
3. Transportation Network Companies (TNCs)
4. Travel Demand Management (TDM)
5. Connected Autonomous Vehicles (CAVs)
6. Traffic Counts
7. System Performance/Congestion Management
8. Other Research Areas



Research Methodology

Survey to peer
MPOs and DOTs

Peer agency
interviews

Literature review
(e.g. validation
studies, case
studies)

Direct vendor
outreach

Internal consultant
research team
nationwide
outreach



Peer MPOs and DOTs

Atlanta Regional Commission	North Central Texas Council of Governments
Capital Region Planning Commission (Baton Rouge, LA)	North Jersey Transportation Planning Authority
Chicago Metropolitan Agency for Planning	Northeast Ohio Areawide Coordinating Agency
Delaware Valley Regional Planning Commission	Portland Metro (Oregon)
East-West Gateway Council of Governments (St. Louis, MO)	Pima Association of Governments (Arizona)
Florida Metropolitan Planning Organization Advisory Council	Regional Transportation Commission of Southern Nevada
Fredericksburg Area Metropolitan Planning Organization	Southeast Michigan Council of Governments
Houston-Galveston Area Council	Southern California Association of Governments
Maricopa Association of Government (Arizona)	Virginia Department of Transportation
Mid-Ohio Regional Planning Commission (Columbus, OH)	Wasatch Front Regional Council
New York Metropolitan Transportation Council	Anonymous
North Central Texas Council of Governments	



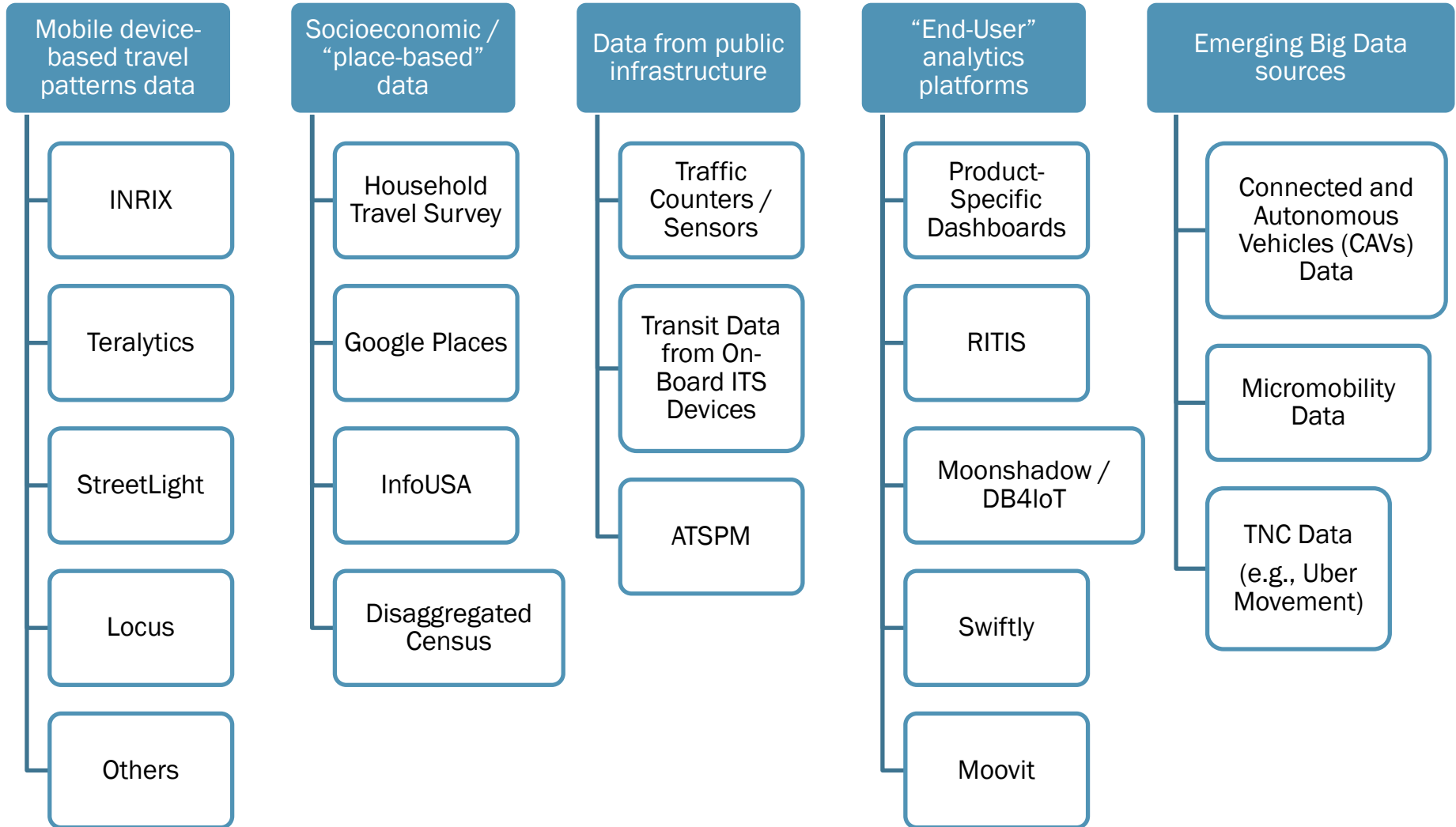
Phase 1: Survey and Interview Findings

- Big Data sources are still new to most MPOs and agencies
- High level of interest; healthy skepticism
- Notable areas in which Big Data is more widely used
 - External travel survey for travel demand model
 - Speed/travel time calibration/validation (aggregate/corridor-level)
 - System congestion monitoring/management
- Lessons learned/concerns
 - Technical processing challenges
 - Sample adequacy and validity
 - Aligning data with needs (e.g. trip purpose)
 - High costs or unclear pricing



Phase 2: Evaluation

Establish a List of Big Data Products for Evaluation



Phase 2: Evaluation Methodology

Evaluate products
for each research
area

- Applicability
- Data validity and coverage
- Resource - technical staff
- Resource - IT/computing/data storage
- Data licensing/sharing restrictions
- Cost

Develop “menu” of
options for
investment and
procurement

- Products meeting several research needs
- Partnerships with states/jurisdictions



Preliminary Findings

- There is no “one size fits all” solution to all the TPB’s research needs
- The landscape of Big Data products is constantly evolving, even throughout the course of this study
- Opportunities for collaboration and data sharing exist to aid in procurement and downstream processing of data
- Certain datasets likely exist but are not yet ready for public agency use

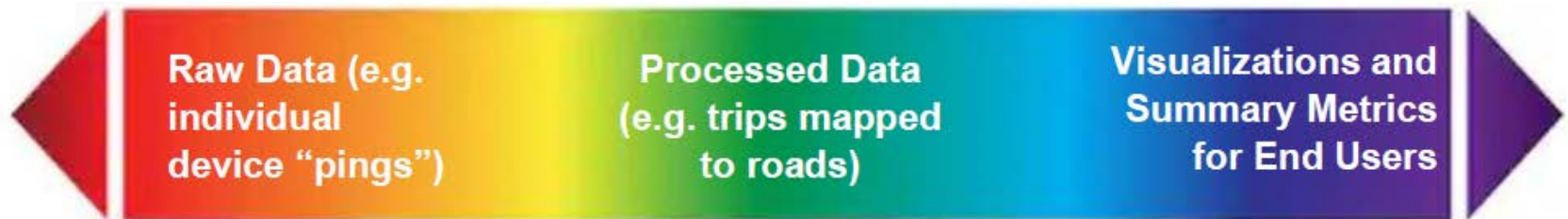
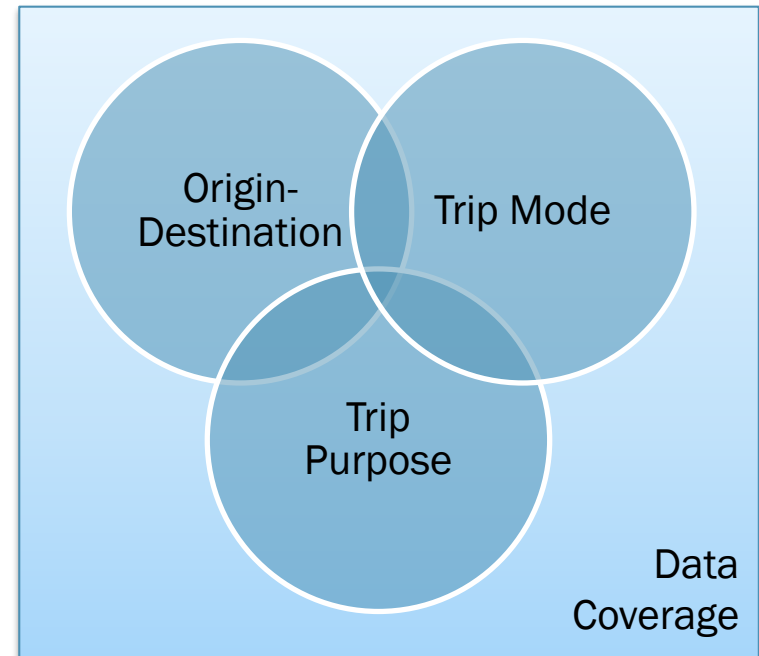


Figure ES-1 | Big Data Product “Spectrum”



No “One Size Fits All”

- Common challenges faced in multiple research areas:
 - Breakdown of travel pattern data by mode
 - Trip purpose
 - Sample size vs. spatial accuracy
 - Large scale implementation



Approach to recommendations:

- *Is there a product that is applicable to multiple research areas?*
- *What are COG/TPB's most pressing needs and biggest concerns?*



Evolving Landscape of Big Data

- FHWA is developing **open source** big data algorithms that are available to all
- Innovative survey methods (integrating mobile devices and Big Data from providers)
- End-user analytics/platform offers computational capabilities
- Data from public infrastructure provides another dimension
- Emerging data sources (e.g., Connected Vehicles, TNCs, micromobility)



Product Category	Product	Travel Demand Forecasting	Travel Demand Management	System Performance and Congestion Management	Transit and Non-Motorized Travel	Transportation Network Companies	Traffic Counts	Connected and Automated Vehicles	Other Research Areas
Mobile Device-Based Travel Patterns Data	INRIX	YES	YES	YES	NO	NO	YES	NO	YES
	StreetLight	YES	YES	YES	YES	YES	YES	NO	YES
	Teralytics	YES	YES	NO	YES	NO	NO	NO	YES
	Locus (Cambridge Systematics)	YES	YES	NO	NO	NO	NO	NO	YES
	Uber Movement	NO	NO	NO	YES	YES	NO	NO	NO
	Taxi/TNC Trip Data	NO	NO	NO	NO	YES	NO	NO	NO
	Strava Metro	NO	NO	NO	YES	NO	NO	NO	NO
Socioeconomic or Place-Based Data	Disaggregate Census Data	YES	YES	NO	YES	NO	NO	NO	NO
	Household Travel Survey	YES	YES	NO	NO	YES	NO	NO	NO
	InfoUSA	YES	YES	NO	NO	NO	NO	NO	NO
	Dun & Bradstreet Business Listings	YES	YES	NO	NO	NO	NO	NO	NO
	CoStar Data	YES	YES	NO	NO	NO	NO	NO	NO
	Google Places	YES	YES	NO	NO	NO	NO	NO	NO
Data from Public Infrastructure	Continuous Traffic Count Station/Sensor Data	YES	NO	YES	NO	NO	YES	NO	NO
	Automated Traffic Signal Performance Measures (ATSPM)	YES	NO	YES	NO	NO	YES	NO	NO
	Transit Data from On-Board ITS Devices	YES	YES	YES	YES	NO	NO	NO	NO
End-User Platforms for Data Analytics	RITIS	YES	YES	YES	YES	NO	YES	NO	NO
	Moonshadow/DB4IoT	YES	YES	NO	NO	NO	NO	NO	NO
	Swiftly	NO	NO	YES	YES	NO	NO	NO	NO
	Moovit	NO	NO	YES	YES	NO	NO	NO	NO
Emerging Big Data Sources – “Wait and See”		--	--	--	YES	YES	--	YES	--
“Yes” indicates the Big Data product is recommended based on the evaluation criteria for the specific research area.									
“No” indicates the Big Data product is not recommended based on the evaluation criteria for the specific research area.									

Opportunities for Collaboration and Data Sharing

- Opportunities for partnerships and collaborations at multiple levels
 - States/jurisdictions
 - Transit agencies
 - End-user analytics/platform providers
 - Mobility providers
 - Within COG/TPB
- Opportunities for data sharing
 - Expanding data spatial coverage from current state agency agreements with vendors
 - Developing new agreements that leverage regional collaboration
 - Central repository of planning data for the region



Known Challenges/Limitations

- Everyone claims to know something, but who is right and to what degree
- Difficulty in understanding/controlling the "black box"
- Extrapolating from “sampled trips” to “counts” and by mode
- Managed lanes (especially privately-owned)
- TNC data largely inaccessible; mobility analytics provided by TNC vendors have limited usage



Next Steps

- Review recommendations
- Consult with agency partners
- Develop implementation/procurement strategies



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