CIV 590 Urban Transportation Planning

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Dr. Xiao Qin
University of Wisconsin-Milwaukee

About the Instructor

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- **Education:**

Ph.D. – Civil Engineering, University of Connecticut

MS – Transportation and Highway Engineering, Southeast University

BS – Transportation and Highway Engineering, Southeast University

- **Experience:**

01/2015- present	University of Wisconsin-Milwaukee
09/2009- 12/2014	South Dakota State University
10/2004- 08/2009	University of Wisconsin Madison
08/2002- 09/2004	Maricopa Association of Governments (MAG)

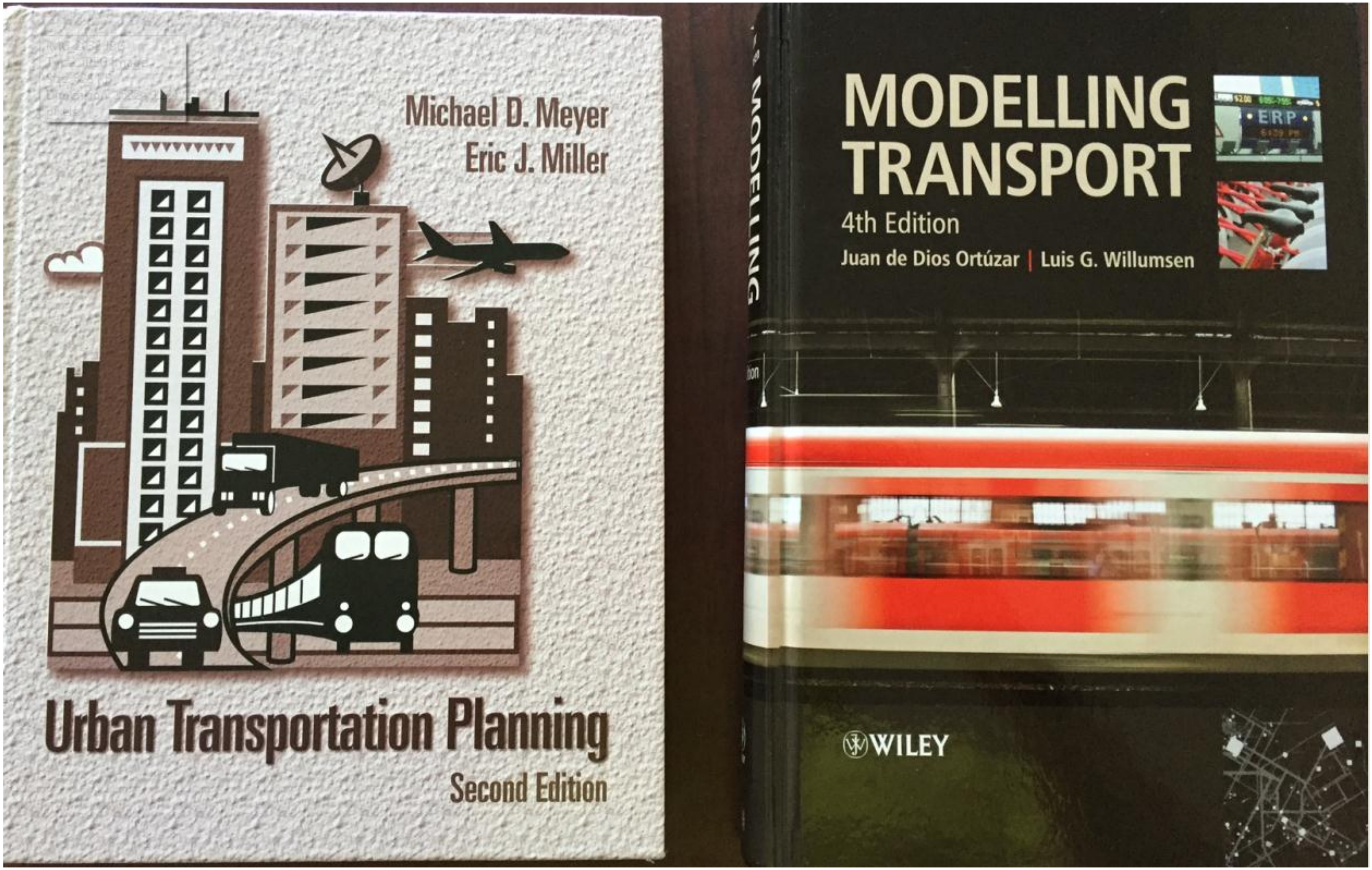
Let us know something about you.

- Why are you taking the transportation planning class?

- What do you expect to learn from this class?

ABOUT THE CLASS

- **Recommended Texts**
  1. Meyer, Michael D. and Miller, Eric J., Urban Transportation Planning: A Decision-Oriented Approach, 2nd Edition, McGraw Hill.
  2. J. Ortuzar and L. Willumsen, Modeling Transport, third Edition, Wiley and Sons
  3. Additional readings will be distributed in class


Michael D. Meyer
Eric J. Miller
Urban Transportation Planning
Second Edition
MODELLING
TRANSPORT
4th Edition
Juan de Dios Ortúzar | Luis G. Willumsen
WILEY
MODELLING

Learning Objectives

The primary objectives of the course are to define the context of urban transportation planning, to introduce the planning process, and to assess the impact of traffic growth.

1. To gain factual knowledge;
2. To learn fundamental principles, generalizations, or theories;
3. To learn to apply course materials; and to develop skills, competencies, and points of view needed by professionals.

LEARNING OUTCOMES

1. To define the terminologies used in the transportation planning process;
2. To understand the principles and theories behind transportation planning;
3. To articulate the process and steps in the urban transportation modeling system;
4. To apply appropriate methods and tools to estimate and assess traffic impacts due to land development and traffic growth.

Course Requirements

1. Classroom attendance is required.
2. Homework will be due one week after it is assigned and collected at the beginning of the class of the due date unless specific instructions are given before the assignment. There is an automatic deduction of 50% of the total grade for any late homework.
3. All written responses in this course shall be in your own words and ideas.

Grading and grading scale

Homework Assignments: 40%

Final Exam: 55%

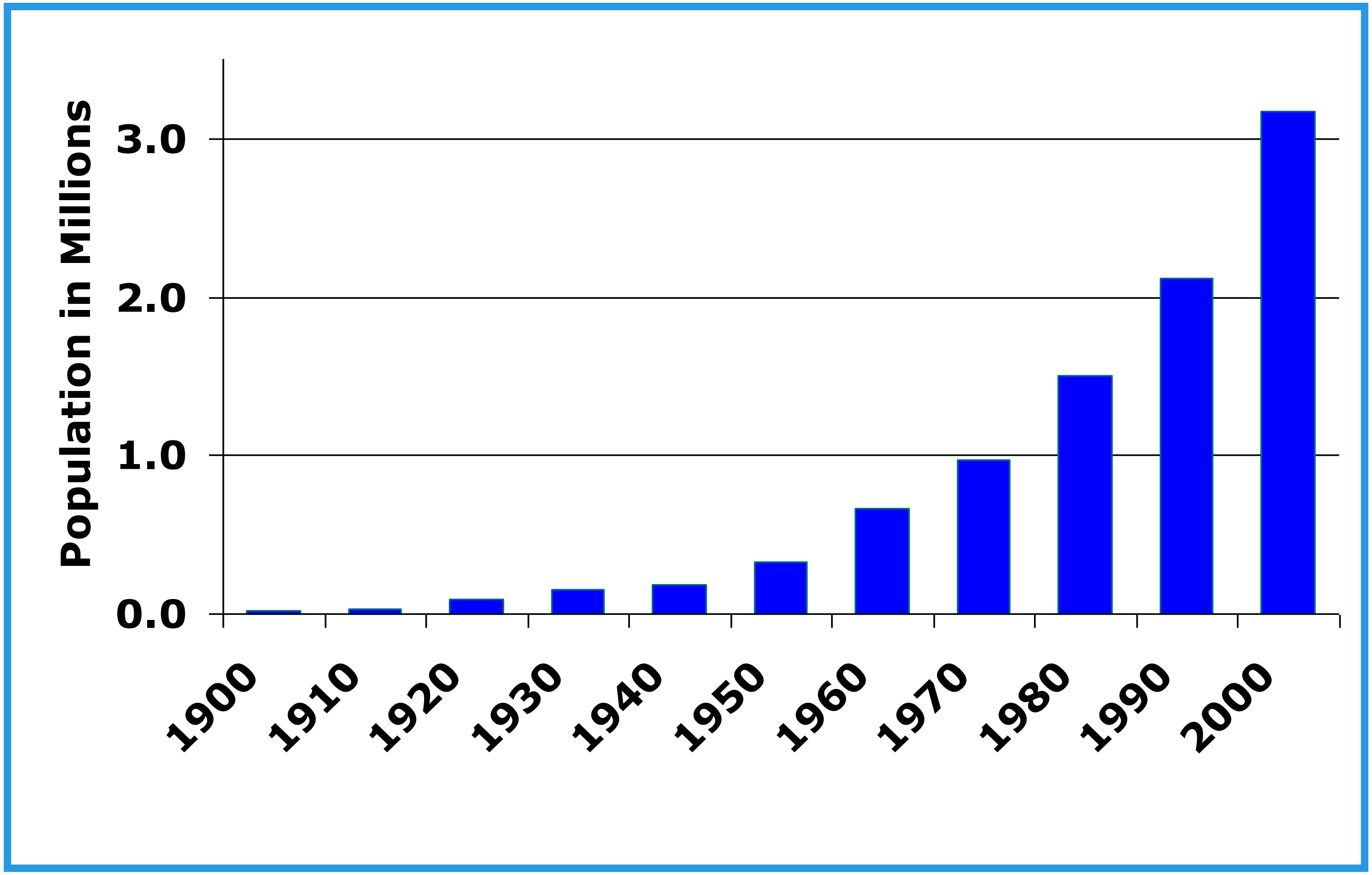
Class Attendance 5%

Letter grade	GPA range	Grade point per semester hour
A	90% and above	4.00
B	80% - 89%	3.00
C	70% - 79%	2.00
D	60% - 69%	1.00
F	Below 60%	0.00

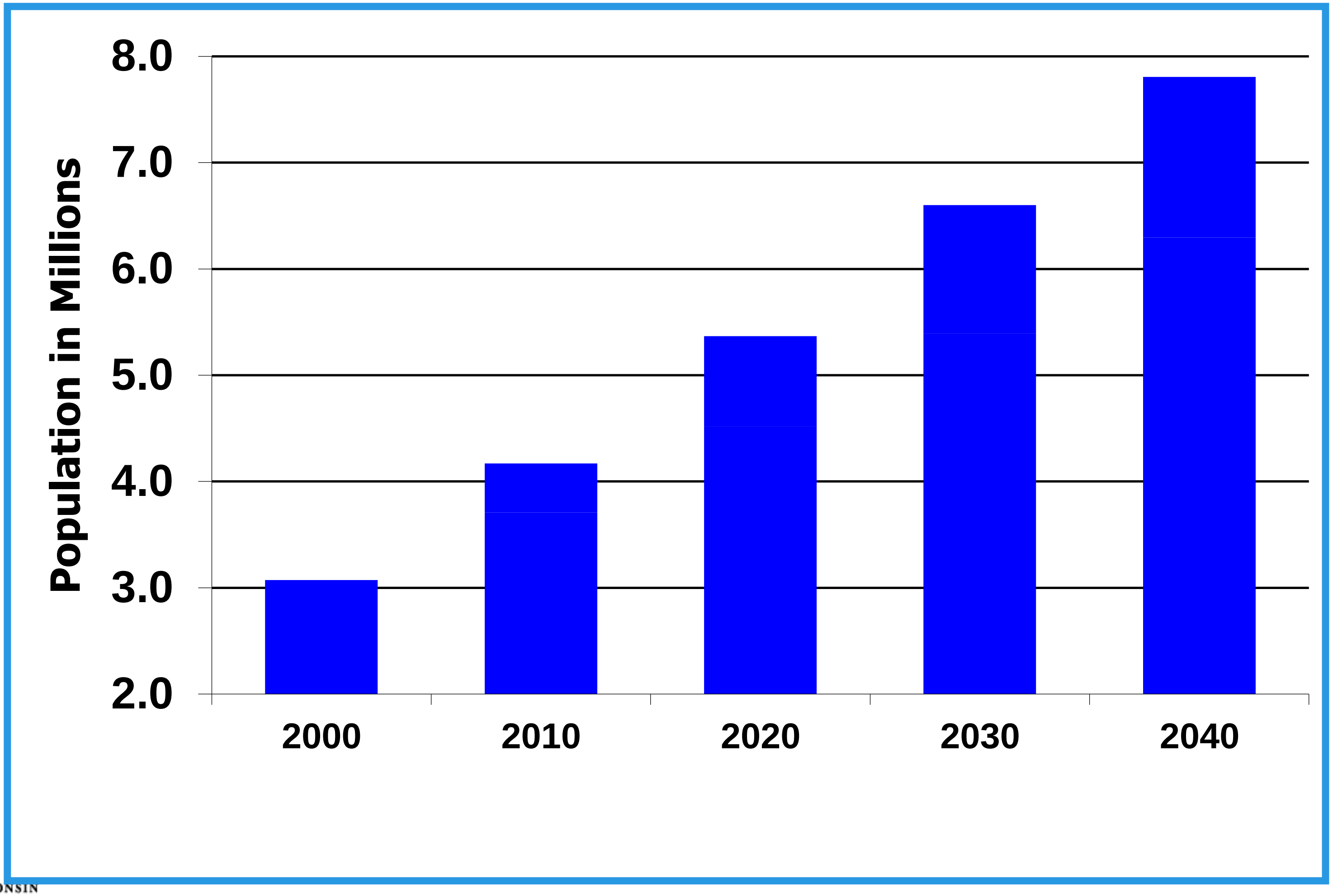
Urban Transportation Planning

- Urban
- Transportation

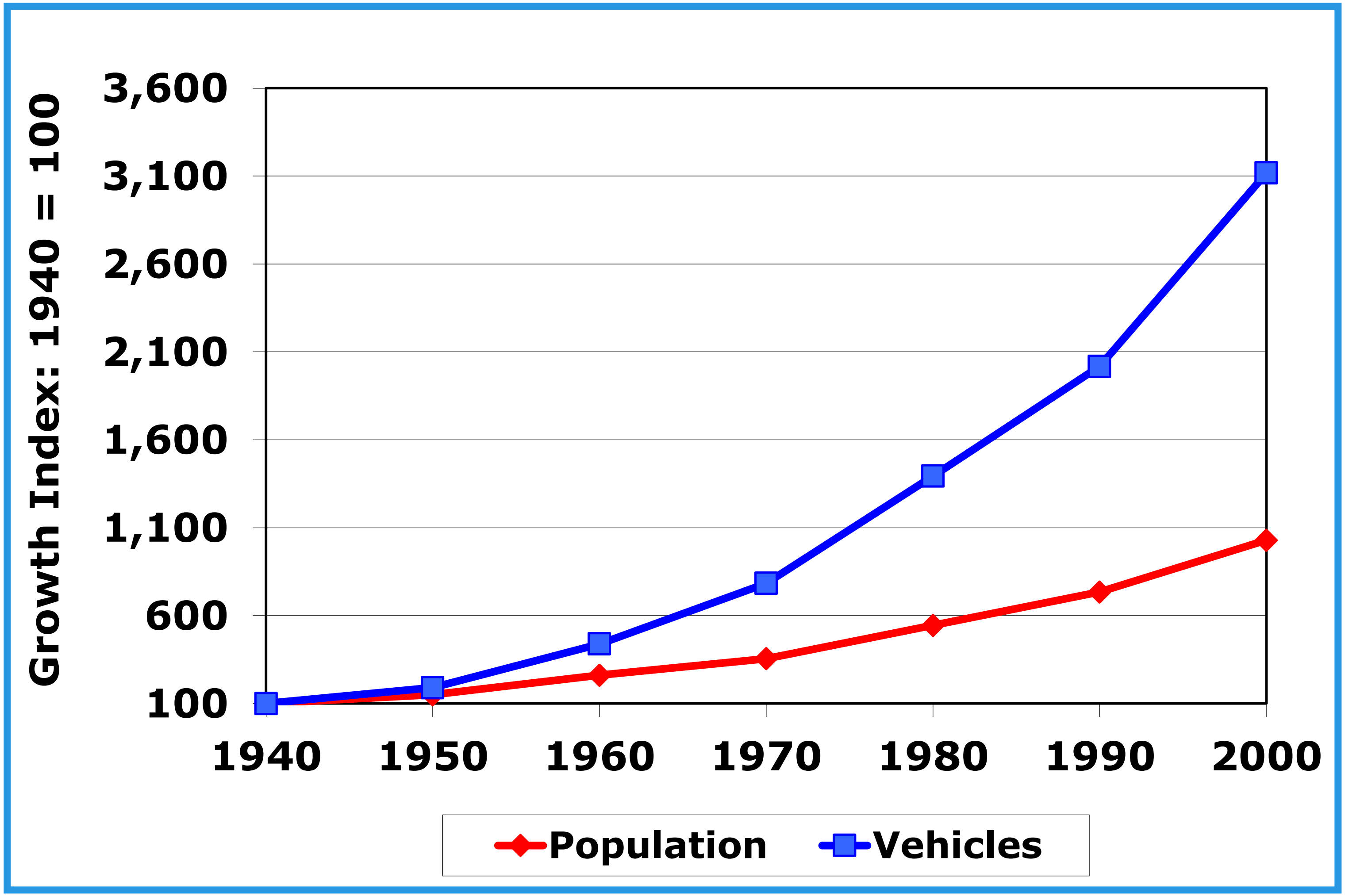
Maricopa County's population grew by about 45% each decade since 1960.



THE REGION WILL CONTINUE TO GROW



The Challenge for Transportation Planning: Travel is increasing faster than population



About 53,400 results (0.28 seconds)

This city has the absolute worst **traffic**
Fortune - Aug 26, 2015
... and San Jose (67 hours), according to the **2015 Urban** Mobility Scorecard. The **report** pointed out that overall **traffic congestion**

According to the *2015 Urban Mobility Scorecard*, travel delays due to traffic congestion caused drivers to waste more than 3 billion gallons of fuel and kept travelers stuck in their cars for nearly 7 billion extra hours – 42 hours per rush-hour commuter. The total nationwide price tag: $160 billion, or $960 per commuter.

GeekWire USA TODAY Portland Trib... 24/7 Wall St. Transport To... Chicago Trib...

Explore in depth (623 more articles)

DC tops list of nation's worst **traffic** gridlock
WTOP - Aug 25, 2015
Traffic congestion nationally reached a new peak last year and is greater than ever before, according to a **report** by. ... Institute, and INRIX, a data technology company, have released their **2015 Urban** Mobility Scorecard.

New **report**: CT **traffic** is bad — and likely to get worse
The CT Mirror - Aug 26, 2015

Traffic just keeps getting worse
Daily Herald - 13 hours ago

What is Transportation Planning?

Where are we now?

(such as trends and conditions relating to population, the transportation system, and the general state of the urban area)

Where do we want to go?

(major issues, public outreach results, obstacles, and opportunities)

What will guide us?

(goals, objectives, public input, and performance measures)

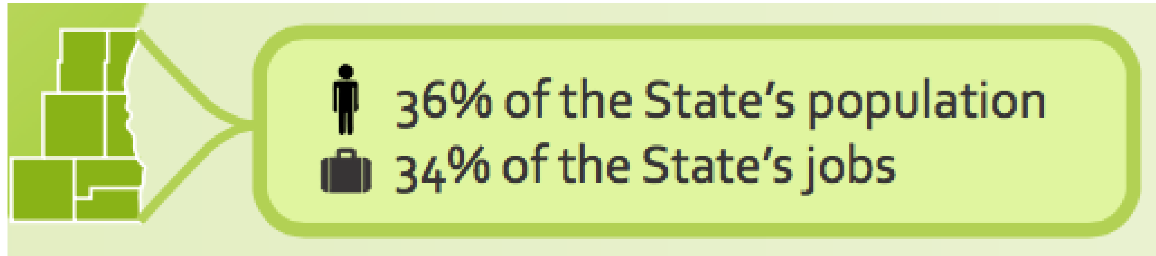
How will we get there?

(revenue estimation, project implementation, public/private partnership, and policy changes)

BIGGEST CHALLENGE

Balance the many competing visions of what the future should look like and develop an **informed** program of action among competing interests that will improve a community's quality of life and enhance transportation system performance.

Can you name a few competing visions/interests?



VISION 2050

Southeastern Wisconsin is forecasted to add another 334,000 residents and 210,000 jobs by 2050.

1. Balance Jobs and Housing
2. Ensure goods move efficiently
3. Develop an Integrated, Multimodal Transportation System
4. Achieve a Robust, Regional Transit System
5. Develop an Expansive, Well-Connected Bicycle and Pedestrian Network
6. Maintain Small Town Character
7. Preserve Natural Resources, Open Spaces, and Farmland
8. Prepare for Change in Travel Preferences and Technologies
9. Be Environmentally Responsible
10. Make Wise Infrastructure Investments
11. Work Together Toward Common Goals

Three Dimensions in Planning

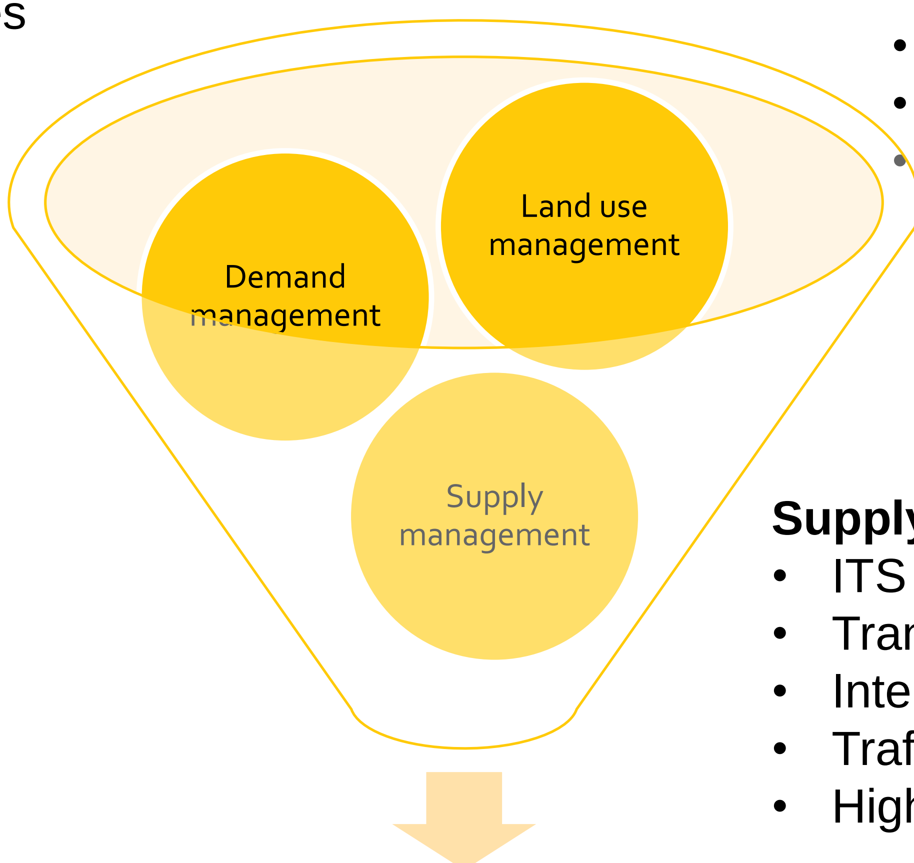
- **Demand**: Need for travel (volume, O/D, etc.) what can we do to understand and influence the demand? (demand are "people", not too easy to predict)

- **Supply**: level of service (time, speed, cost, etc.). what can we do to improve service? (easier to figure out)
  - Performance (service level provided to customers)
  - Impacts (environmental, social, etc.…)
  - Costs (building/operating/maintaining)

- **Land**: trip-making is a function of spatial distribution and use of land which in return can be influenced by the level of accessibility provided by the transportation system.

Demand Management
- Alternative work schedules
- Pricing
- Alternative modes
- Alternative work locations

Land use management
- Planning and zoning
- Phasing
- Urban design
- Mixed use
- Policy



Supply management
- ITS
- Transit services
- Intermodal facilities
- Traffic engineering
- Highway capacity

Goals and objectives

Modeling → Planning → Decision Making

Transportation Modeling

- Models are simplified representation of reality
  - Analytical/simulation
    - Analytical: $y = f(x)$ → might be extremely complex
    - Simulation: mimic the real world →not an easy task
  - Deductive/inductive approach
    - Deductive start from theory (with some assumptions) and build the model and test it with data [pure sciences: math, physics, chemistry]
    - Inductive approach: start from empirical observation and infer models (regressions) [social sciences, dealing with humans]

Examples of Transportation Modeling

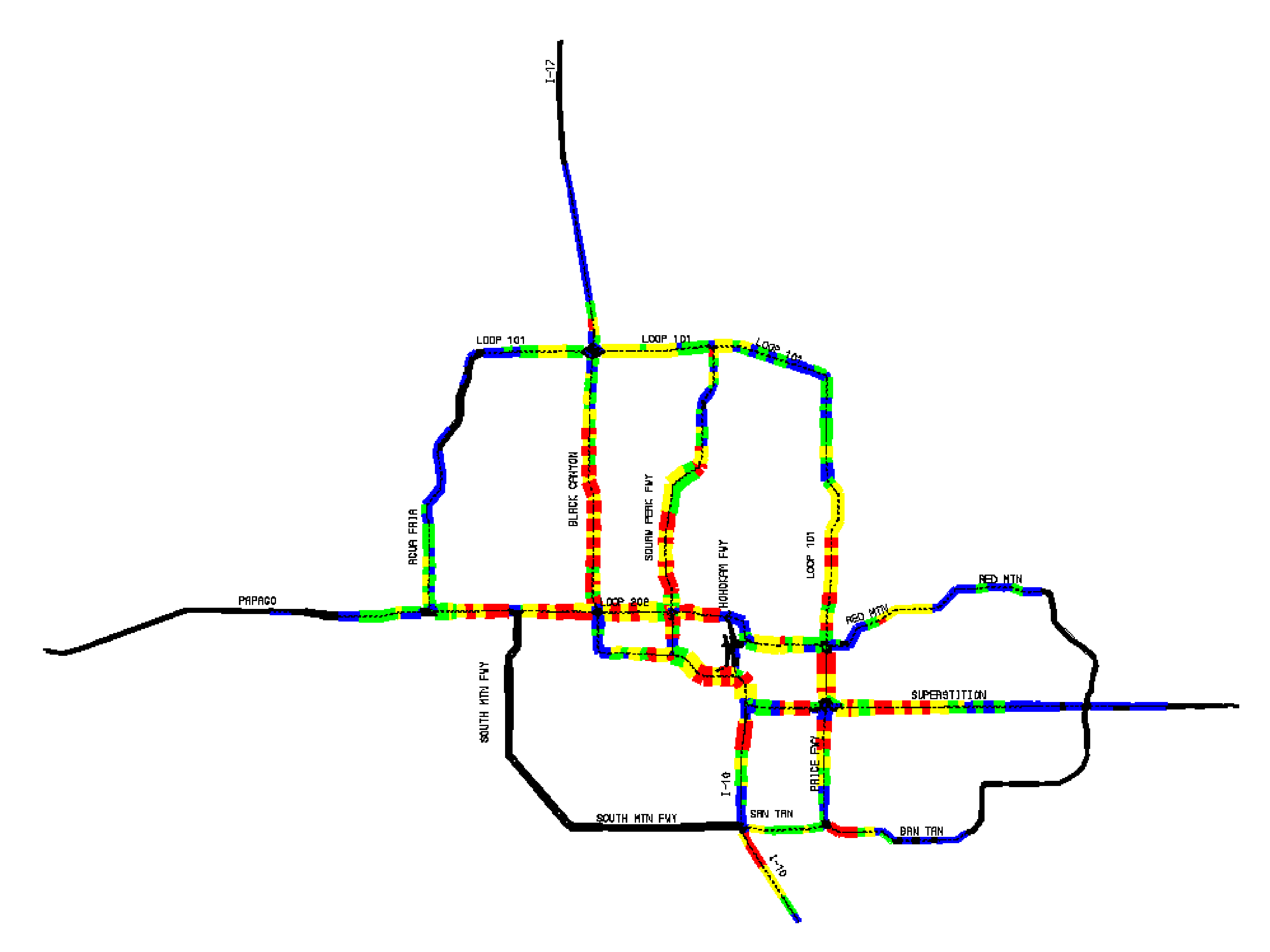
- Traffic flow (traffic stream models, shock wave, car following, etc.)
- Intersection signal control
- Demand forecast
- Route choice
- Network equilibrium
- Tolling models on highways
- Ramp metering
- Others

FREEWAY LEVELS OF CONGESTION

emme/2

LINKS:
vdf=11,51,10

COL-IND:@vcidx



LEGEND

VOLUME/CAPACITY RATIO

LOS A:

LOS F:

SCALE: 15000

50000

100000

150000

200000

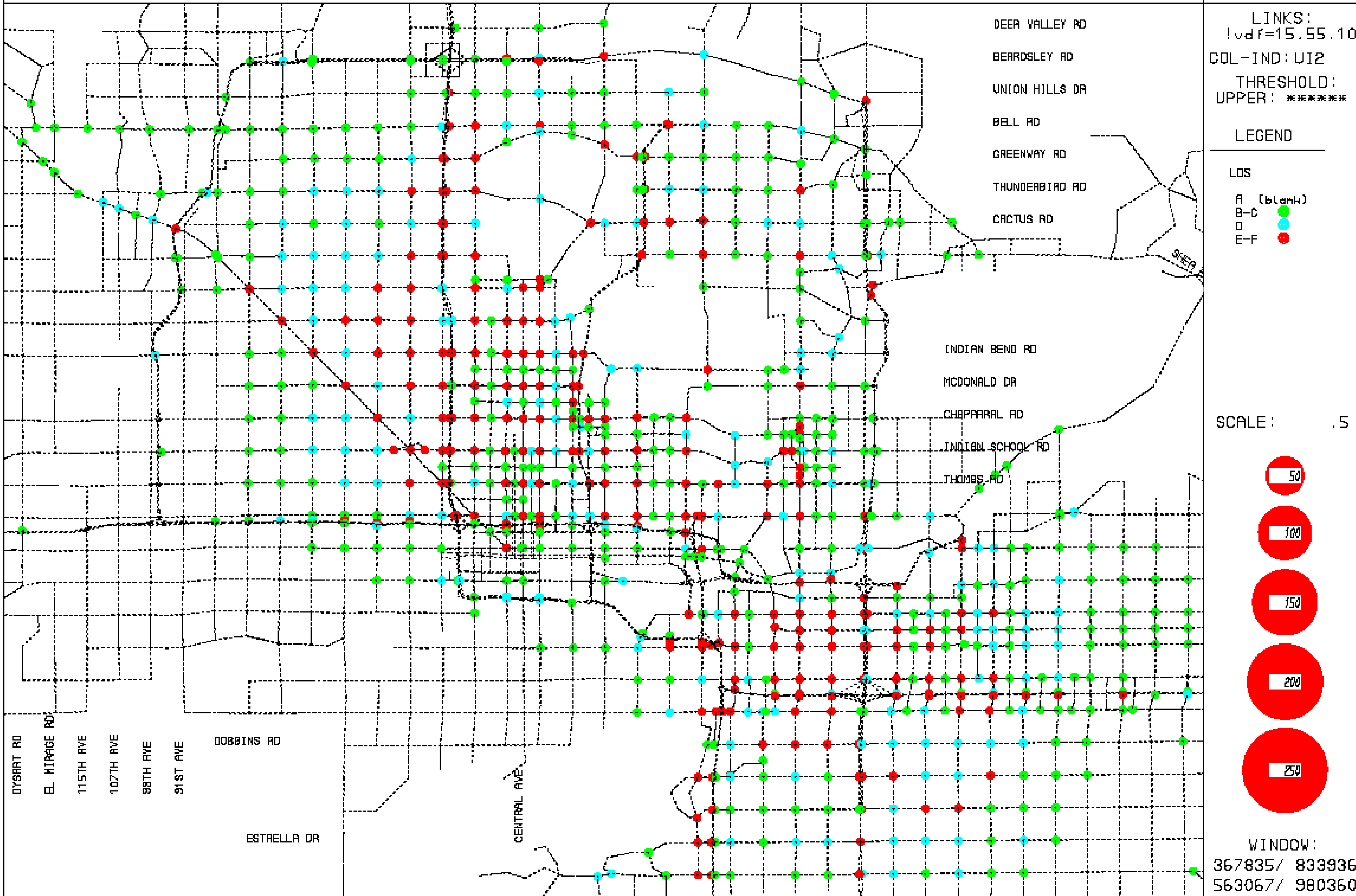
250000

WINDOW:
267418/ 793440
641084/1073690

EMME/2 PROJECT: 2015G2
SCENARIO 2: Daily Highway Network

98-04-17 13:34
MODULE: 6.12
MAGTPO......pj

INTERSECTION LEVELS OF SERVICE



EMME/2 PROJECT: 2000 BUILD W/T2000R2 w/runall5 (revised)
SCENARIO 7: PM Peak Hour Volumes

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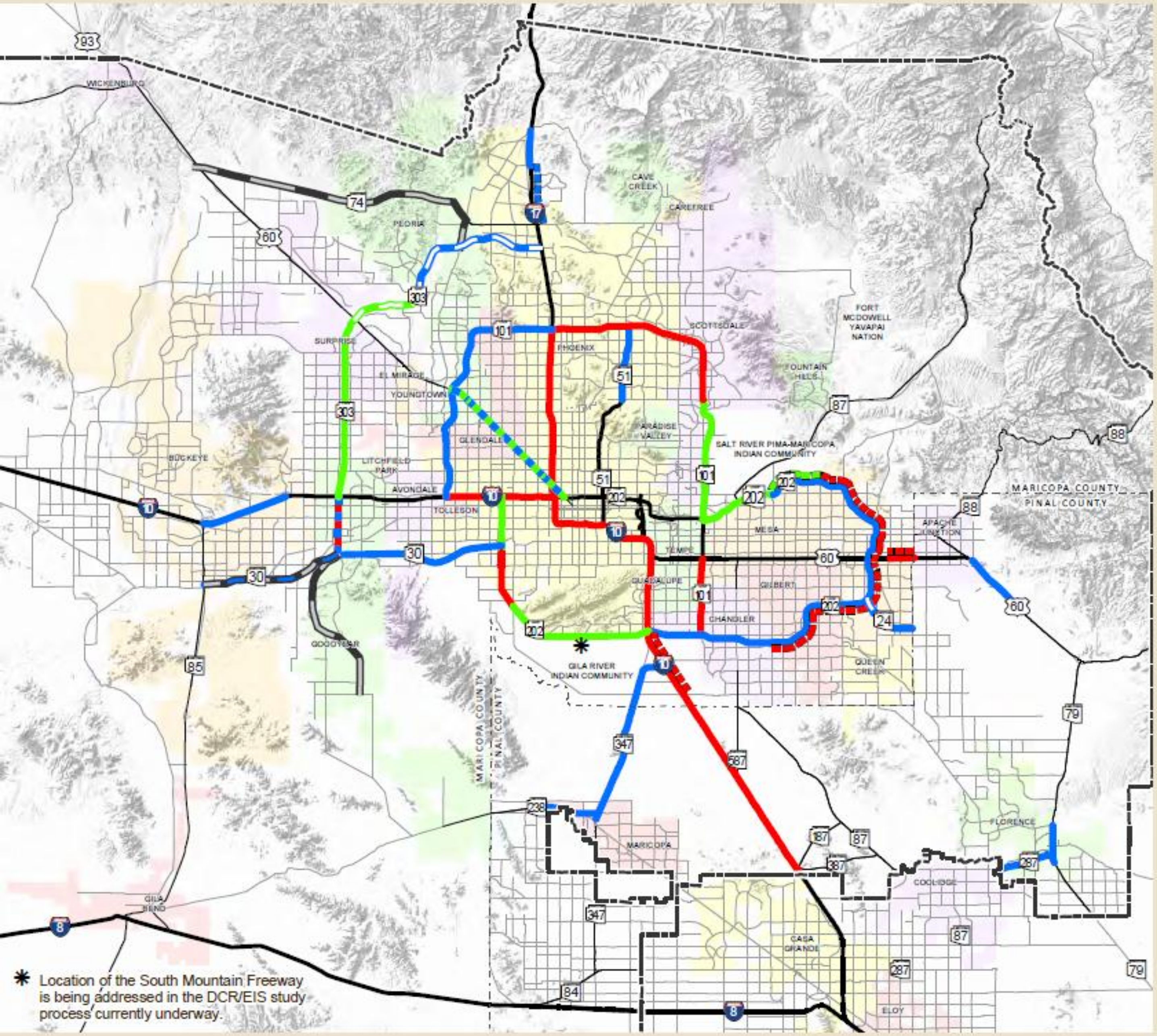
MODULE: 2.13
MACTPO......pj

2035
Regional Transportation Plan
Fig. 8-4

REGIONAL TRANSPORTATION PLAN

MARICOPA ASSOCIATION of GOVERNMENTS

Regional Freeway/Highway Projects Phasing
(FY 2014 - FY 2035)



- Group 1 (FY 2014 - FY 2018)
- Group 2 (FY 2019 - FY 2026)
- Group 3 (FY 2027 - FY 2035)

Broken lines represent HOV lane phasing

- Upgrade to Full Freeway, Group 1
- Upgrade to Full Freeway, Group 3
- Right of Way Preservation Group 3, Includes Interim Construction
- Right of Way Preservation Group 3
- Freeways
- Other Roads
- Metropolitan Planning Area Boundary
- County Boundary

Alignments for new freeway, highway, arterial, and light rail/high capacity transit facilities will be determined following the completion of appropriate design and environmental studies.

* Location of the South Mountain Freeway is being addressed in the DCR/EIS study process currently underway.

While every effort has been made to ensure the accuracy of this information, the Maricopa Association of Governments makes no warranty, expressed or implied, as to its accuracy and expressly disclaims liability for the accuracy thereof.

0 5 10 15 Miles

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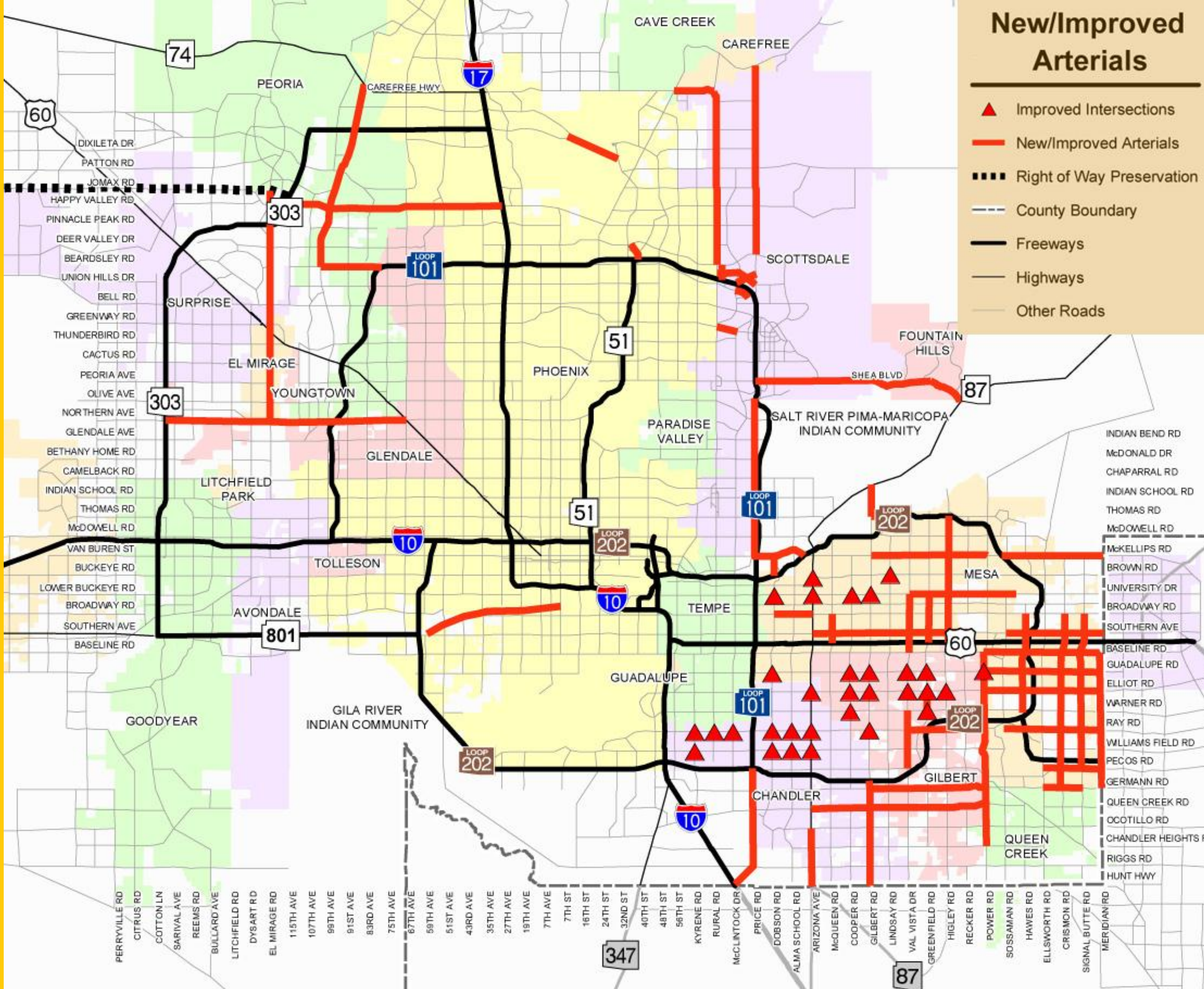
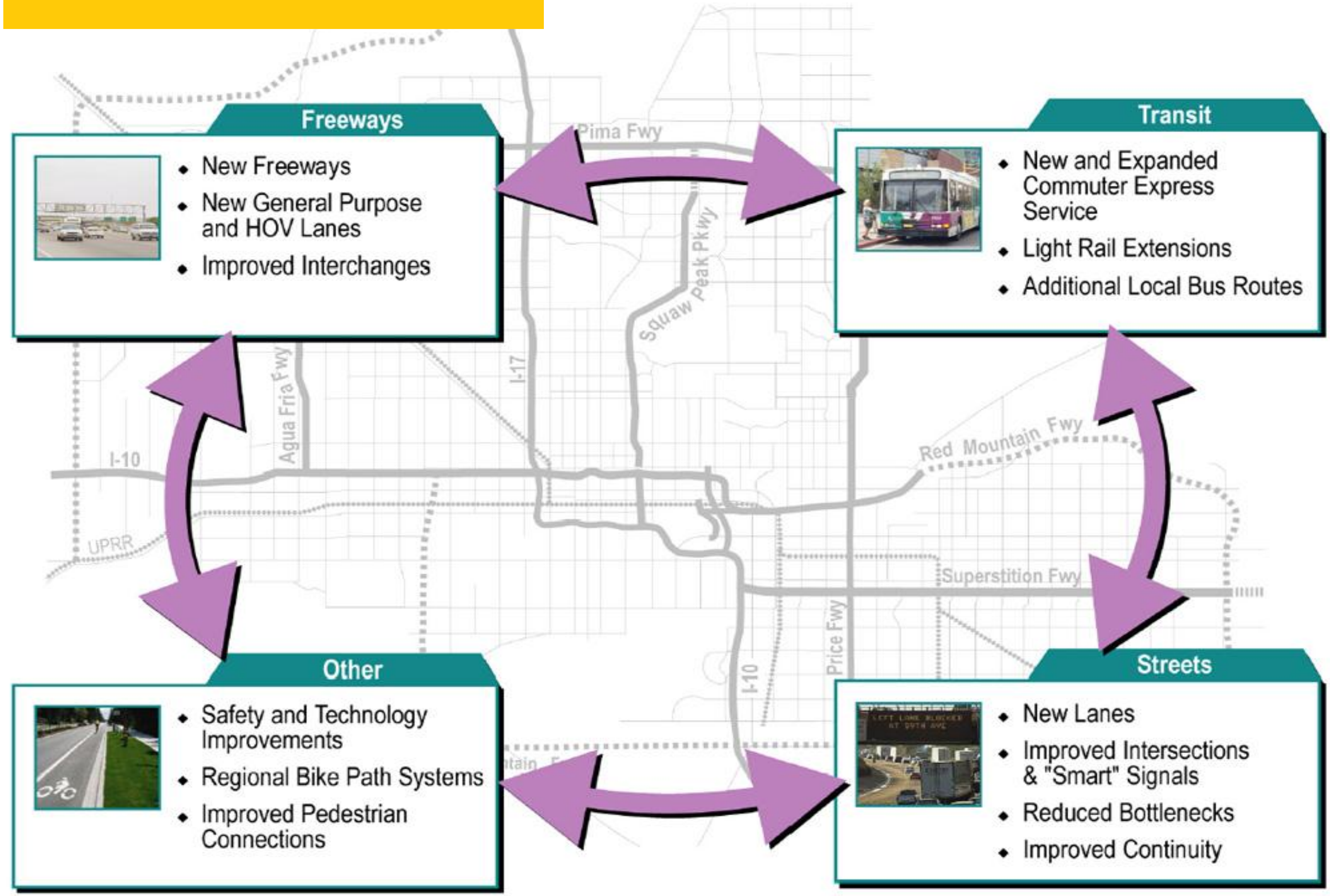


Arterials and Intersections

ALTERNATIVES




FUTURE AVE
VISION ST

- Are we doing fine right now?
- Transportation ecosystem is changing,…
- AV,CV, EV, HV, … are reshaping our transportation business
- Big Data, AI, Internet of Things (IoT)
- Better decision making (in investment and operations)

2017 INFRASTRUCTURE REPORT CARD

WISCONSIN INFRASTRUCTURE OVERVIEW

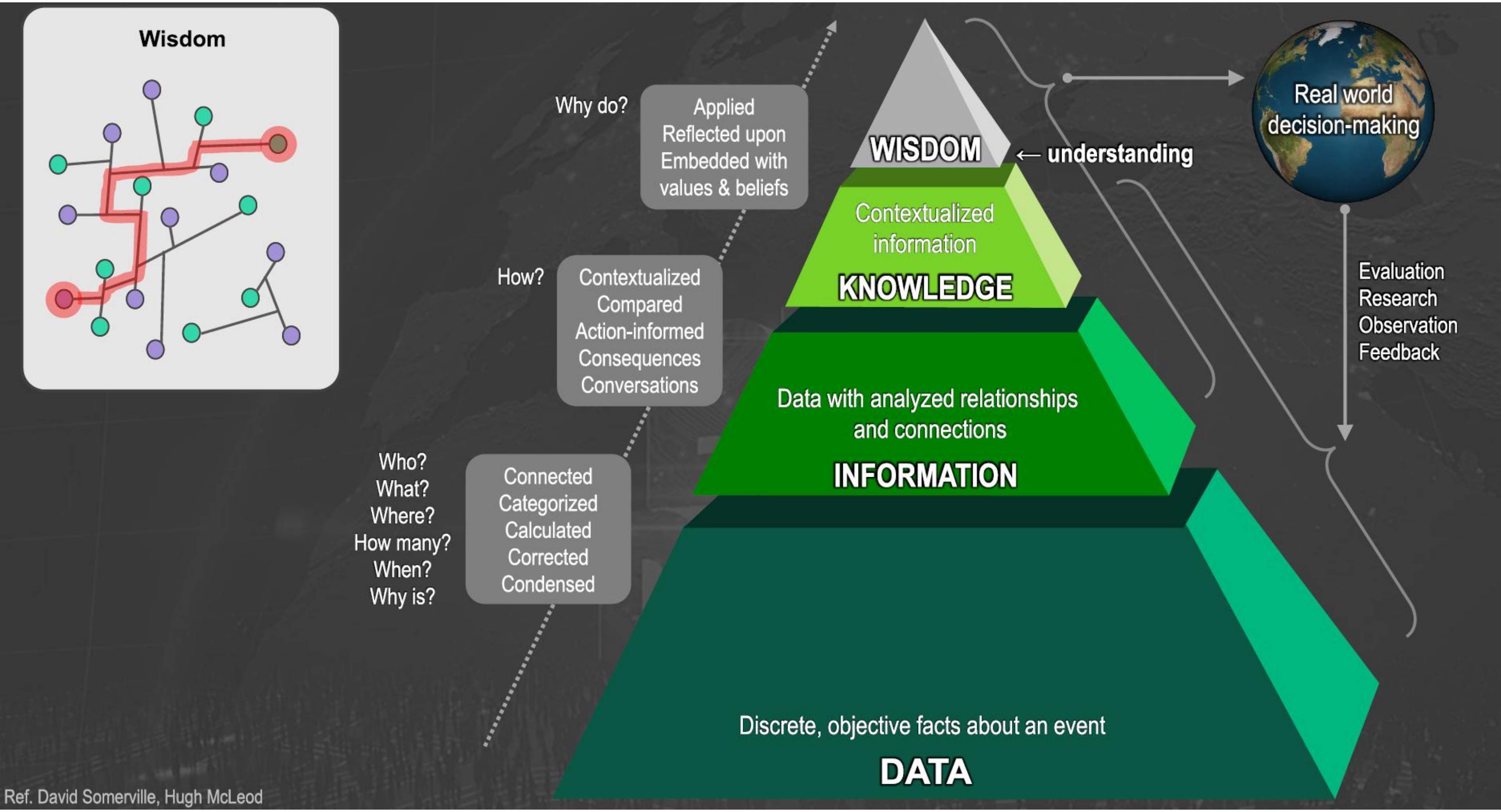
While the nation's infrastructure earned a "D+" in the 2017 Infrastructure Report Card, Wisconsin faces infrastructure challenges of its own.

- **115,372** miles of Public Roads, with **27%** in poor condition
- **$637** per motorist per year in costs from driving on roads in need of repair
- **1,232 (8.70%)** of the **14,230** bridges are **structurally deficient**
- **157** high hazard dams

Source: https://www.infrastructurereportcard.org/state-item/wisconsin

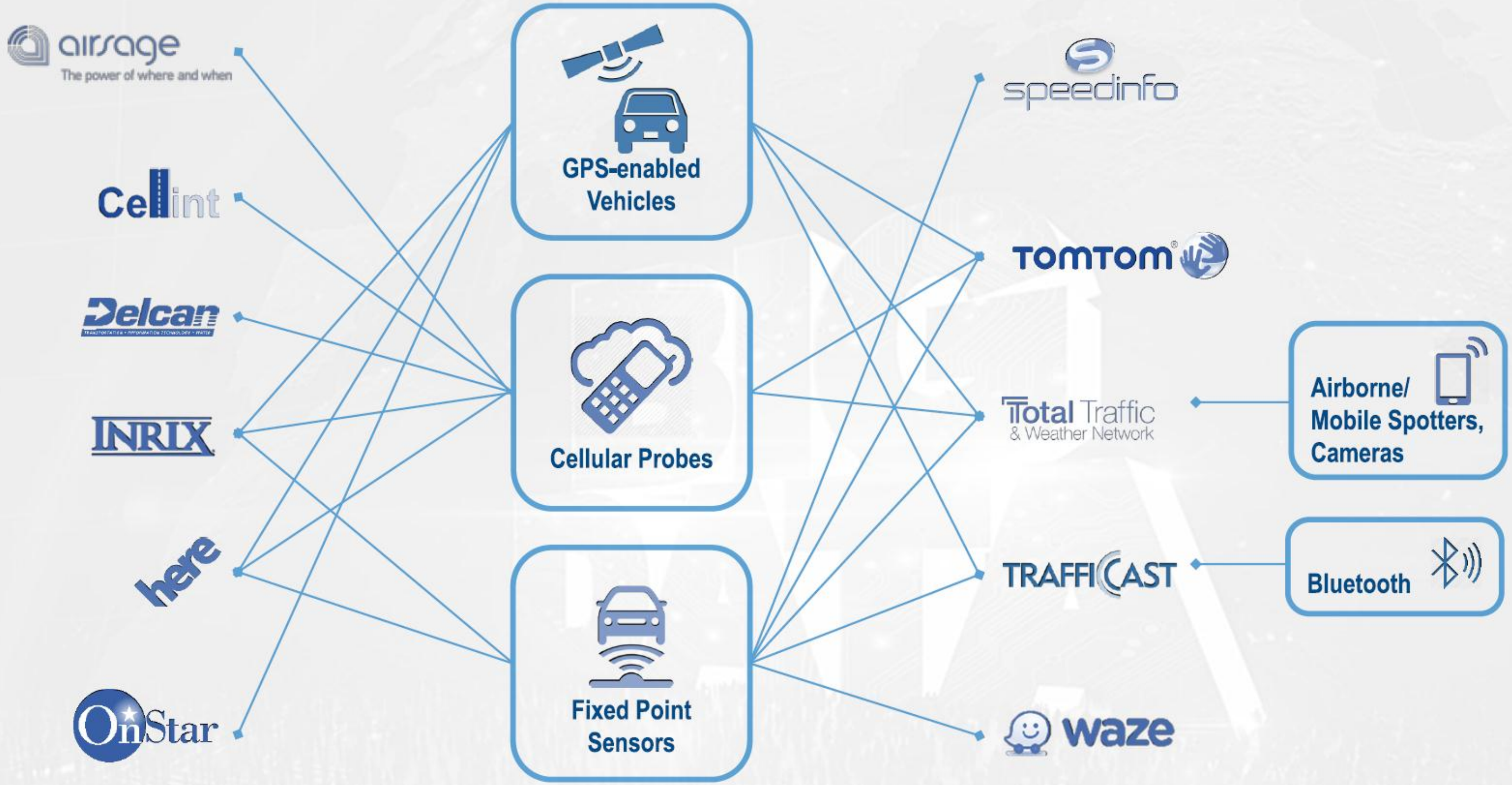
Planning	Design	Operations
Direct TDF 4 step TDM (error propagation) ⬇ ABM (too many assumptions and parameters)	HCM 1950 : focus on capacity 1965 : LOS, bus transit 1985 : pedestrians, bicycles 1994, 1997 2000 : multiple parts 2010 : multimodal focus 2015, 2016 Greenbook GD	MUTCD 1927, 1930, 1942, 1948, 1961, 1971, ..., 2009 HOV, RMS, ITS .....

7 TECHNOLOGIES ARE TRANSFORMING THE INDUSTRIES COVERED BY DIGITAL TRANSFORMATION INITIATIVE

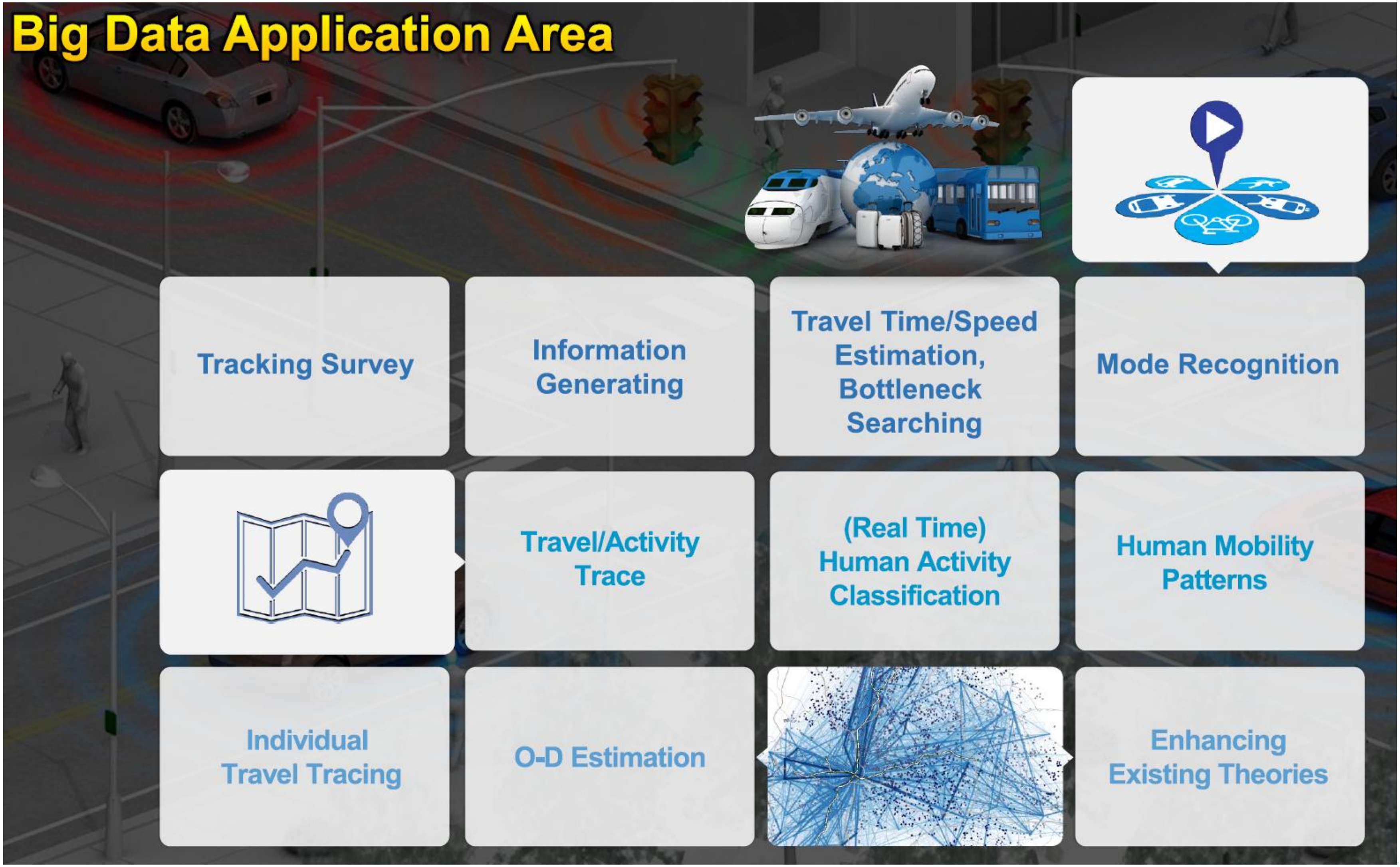

Wisdom
Why do?
Applied
Reflected upon
Embedded with
values & beliefs
How?
Contextualized
Compared
Action-informed
Consequences
Conversations
Who?
What?
Where?
How many?
When?
Why is?
Connected
Categorized
Calculated
Corrected
Condensed
WISDOM
← understanding
Contextualized
information
KNOWLEDGE
Data with analyzed relationships
and connections
INFORMATION
Discrete, objective facts about an event
DATA
Real world
decision-making
Evaluation
Research
Observation
Feedback
Ref. David Somerville, Hugh McLeod

Big Data in Transportation

(Provider Primary Data Sources)



Ref. TTI, Synthesis of TXDOT Uses of Real-Time Commercial Traffic Data, 2012


Big Data Application Area
Tracking Survey
Information Generating
Travel Time/Speed Estimation, Bottleneck Searching
Mode Recognition
Travel/Activity Trace
(Real Time) Human Activity Classification
Human Mobility Patterns
Individual Travel Tracing
O-D Estimation
Enhancing Existing Theories

DOT Smart City Challenge

1,400 local officials, companies, academics and non-profits joined our webinars

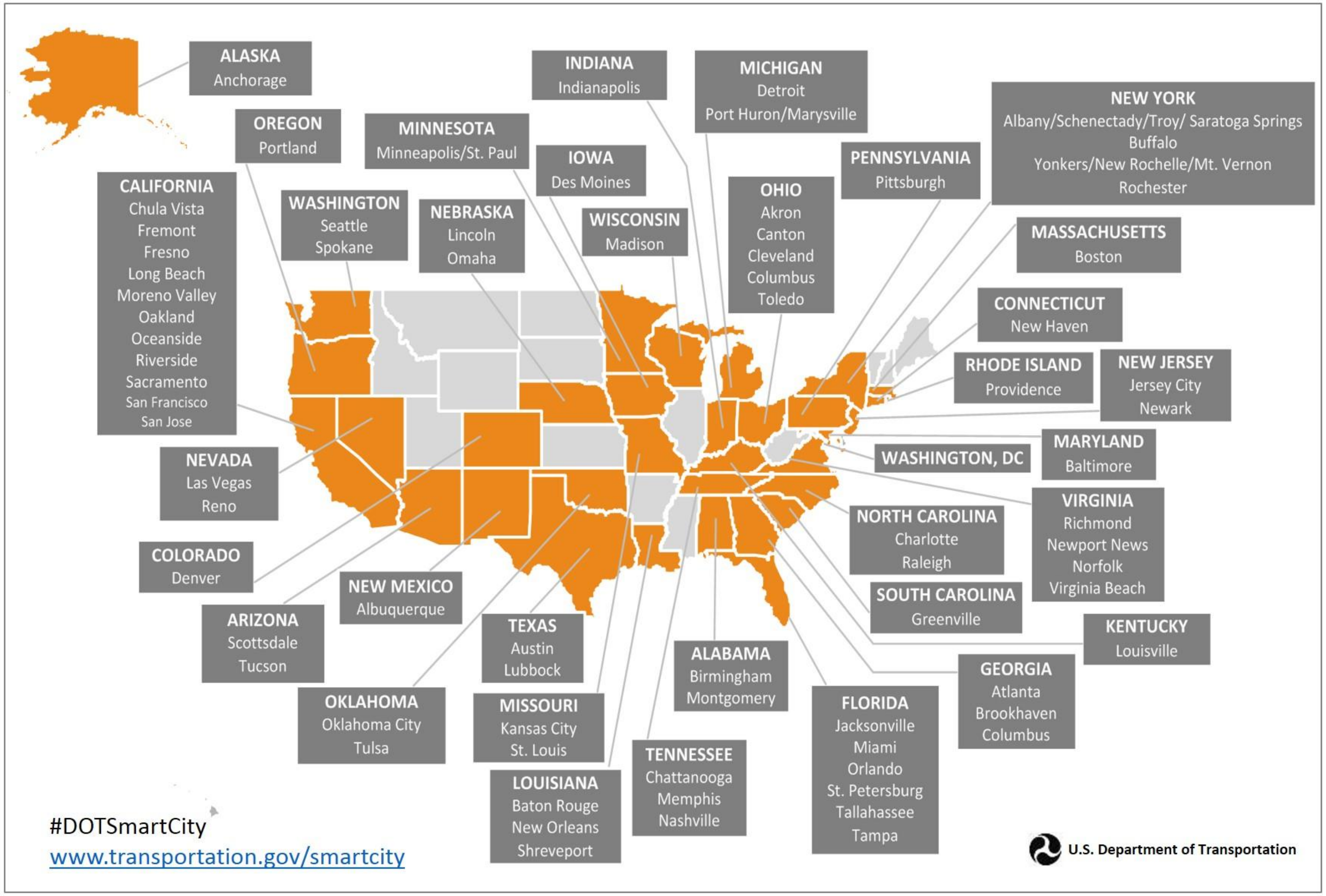
800 people participated in our Smart City Forum

300 companies have expressed interest in partnering

77 applications received for the Smart City Challenge

5 Smart City Challenge Finalists to be announced in March at SXSW

1 Smart City Challenge Winner announced in June



The USDOT has pledged up to $40 million to one city to help it define what it means to be a “Smart City “and become the country’s first city to fully integrate innovative technologies – self-driving cars, connected vehicles, and smart sensors – into their transportation network.

Smart City Pitches

- San Francisco:

https://www.youtube.com/watch?v=11Rr7W4rRuk&list=PLEoJbKk9QnJ39QDizBR8pluuY6dfB9kAZ&index=2

- Pittsburgh:

https://www.youtube.com/watch?v=yyYhSUAZOAI&index=4&list=PLEoJbKk9QnJ39QDizBR8pluuY6dfB9kAZ

- Columbus:

https://www.youtube.com/watch?v=bFobyi6eRGI&index=6&list=PLEoJbKk9QnJ39QDizBR8pluuY6dfB9kAZ

Questions….?

Have a great semester!