# **Method, Model, and Data Session**

# Method, Model, and Data Session

- **Purpose of Session:**
  - Listen and gather Information on the CTSW Study's modeling, data, and methods

- **Role of the Facilitator:**
  - Facilitate meeting information
  - Time Keeper
  - Use of Parking Lot

# Data, Modeling, and Methodology

- Safety

- Pavement

- Bridge

- Compliance

- Modal Shift

# Pavement Analysis- Method

- (1) Select sample pavement sections that cover full range of pavement type, design, environment, and distribution of observed pavement distresses

- (2) With base traffic, apply *AASHTOWare Pavement ME Design* model to each section with base traffic

- (3) For each section, apply model repeatedly with traffic shifts that cover range of scenarios

- (4) Evaluate the changes in pavement distresses, pavement life, and life-cycle pavement costs

4

# Pavement Analysis- Method

- (5) Expand sample results to full highway network for each scenario

- (6) Analyze sensitivity of findings to changes in traffic shift and sample expansion assumptions

- (7) Allocate changes in costs to vehicle configurations and operating weights

- (8) Compare results with other models

- (9) Evaluate findings across pavement types, climate zones, highway types, and design variables

# Pavement Analysis- Models

- *AASHTOWare Pavement ME Design*

- National Pavement Condition Model (NAPCOM )

# Pavement Analysis- Data

- Pavement Performance (LTPP)

- Truck Traffic

- NAPCOM

- Pavement ME Design

- WIM

- HPMS

# Pavement Analysis

**Are there any past studies focused on pavement that should be included in the literature review?**

# Pavement Analysis

**What models are currently available for estimating the cost of pavement damage caused by larger trucks?**

# Pavement Analysis

**Are there any concerns regarding data sets or models when looking at pavement specific issues?**

# Modal Shift Analysis- Method

- To Provide Basis for Estimating Impacts of Increased Truck Sizes and Weights on Safety, Infrastructure, Economy and Environment

  - Intra-modal Shifts:  Assess changes in the <u>distribution</u> of freight traffic among trucks operating in various configurations at various weights due to changes in truck size and weight limits

  - Inter-modal Shifts:  Assess changes in the <u>volume</u> of freight traffic moving on trucks as a result of changes in the competitive balance between trucks and other modes due to increased truck productivity
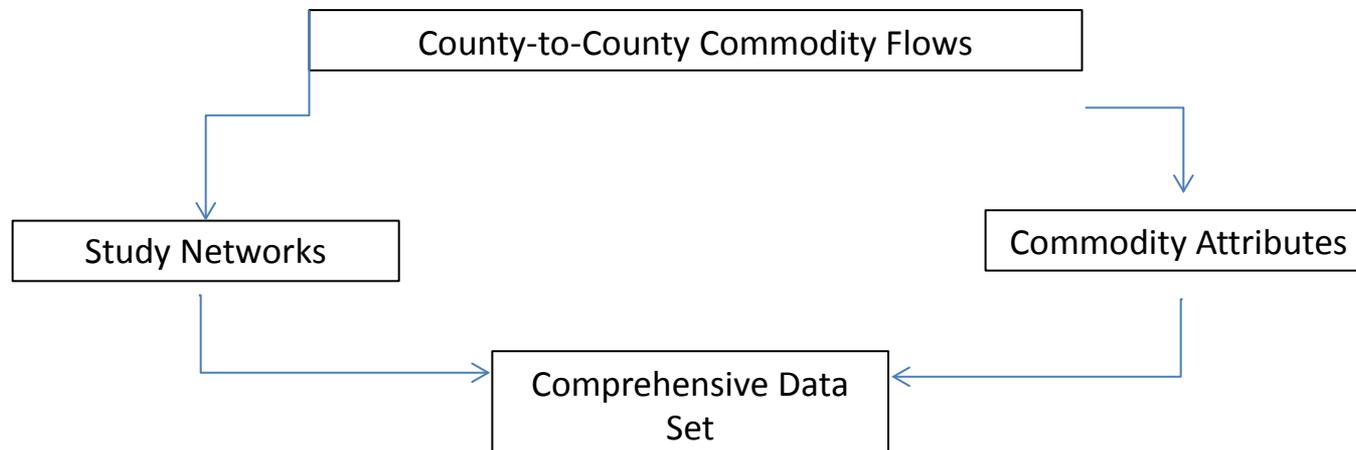
# Modal Shift Analysis- Method

Example of an Approach –

- (1) Base Case  is estimated truck activity under existing truck size and weight limits. Estimate Total Logistics Cost (TLC) for base case vehicles.

- (2) Scenario Case is estimated truck activity under the alternative truck configuration size and weight limits being studied. Estimate TLC for scenario case vehicles.

- (3) Intra- and Inter- modal traffic shifts occur where the Scenario Case TLC is lower than the Base Case TLC.

# Modal Shift Analysis- Method

Example; continued

- (4) Estimate of TLC for each transportation alternative are dependent on distance and volume shipped, transit-time reliability, commodity value and commodity physical attributes.

```
                County-to-County Commodity Flows
                    ↓                      ↓
         Study Networks          Commodity Attributes
                    ↓                      ↓
                Comprehensive Data Set
```

# Modal Shift Analysis

# What data is critical for inclusion as part of the modal shift analysis?

# Modal Shift Analysis

**Are there any models that have been used to estimate transfer of goods?**

- –Between Modes

- –Between Roadway Types

- –Between Truck Types

# Modal Shift Analysis

**What, if any, limitations exist related to data sets or models when studying modal shift?**

# Bridge Structure Analysis - Method

- (1) Use a comprehensive database of up to 500 actual bridges to compile the structural impacts and the resulting costs associated with various trucks in the current truck fleet by using the AASHTOWare Bridge Rating Program, WINBASIC, and a deterioration model based approach for 20 representative bridge types.

- (2) Assess the effects of the structural demands associated with the alternative truck configurations vs. trucks in the current truck fleet by using the AASHTOWare Rating Program (LRFR); as well as the costs for the two truck fleets based on WIM data and the bridge deterioration model based cost analysis.

# Bridge Structure Analysis- Method

- (3) Present findings with respect to relative impacts of the various truck categories and configurations on actual bridges by allocating bridge costs by truck types with the modified ESAL-based damage.

- (4) Identify two representative bridges for each of the common fatigue sensitive details in Categories D and E for a total of eight bridges for fatigue assessments. Will utilize the results from the representative bridges to determine conclusions on the larger inventory and the fatigue effects attributable to non-compliant trucks compared to legal trucks.

# Bridge Structure Analysis- Models

- WINBASIC Program

- AASHTOWare Bridge Rating Program

- Regional Bridge Deterioration Model
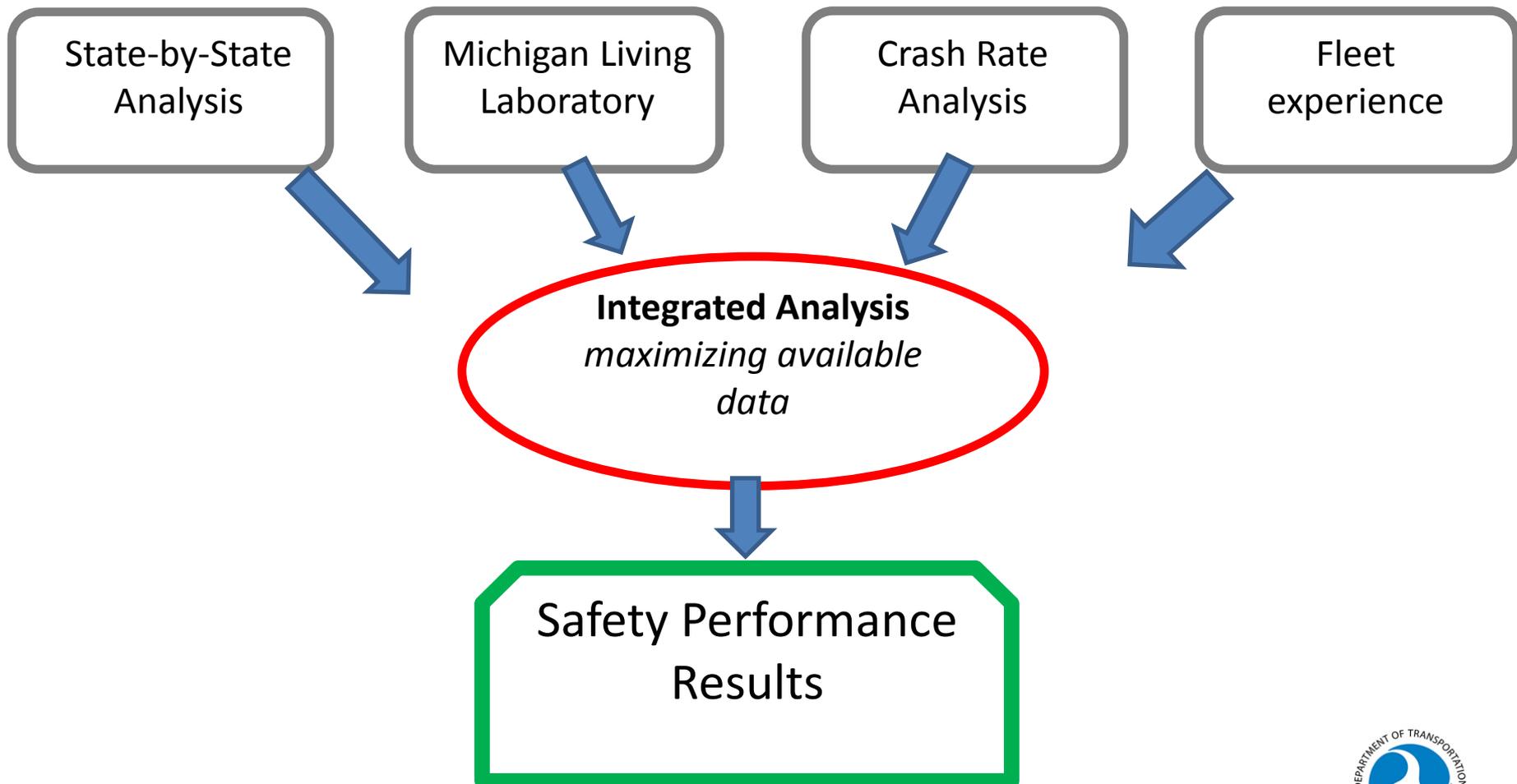
# Bridge Structure Analysis- Data

- National Bridge Inventory (NBI)

- Weight Limits

- Steel Fatigue

- WIM (using NCHRP 12-76 Protocol)

- State Historical Cost Data

# Bridge Structure Analysis

## What models or studies are available to evaluate the impact of large trucks on bridges?

- On structural bridge conditions
- On rate of bridge fatigue

# Safety Analysis Multi-Level Approach

| State-by-State Analysis | Michigan Living Laboratory | Crash Rate Analysis | Fleet experience |

**Integrated Analysis**
*maximizing available data*

Safety Performance Results

# Safety Analysis- Method

- (1) Determine safety performance results

- (2) Use safety inspections and violations analysis to identify Violation Patterns

- (3) Use vehicle simulation to evaluate performance measures, practical loading, and combine measures into single numeric performance ranking using 3S2 (80k) as control vehicle

- (4) Prepare truck crash, truck stability and control, and safety inspection/violation findings

# Safety Analysis- Model

- Vehicle Simulation- to evaluate performance measures, understand practical loadings, and combine metrics into single numeric ranking.

# Safety Analysis- Data

- Large Truck Crash Causation Study (LTCSS) Data Set
- Motor Carrier Management Information System (MCMIS)
- Commercial Motor Vehicle Inspection Records
- Highway Safety Information System (HSIS)
- UMTRI's Trucks Involved in Fatal Accidents Data Set
- Weigh-in-Motion Data
- Risk Factors
- Highway Performance Monitoring System (HPMS)
- Vehicle Stability Observations and Measurements
- Highway Geometric Vehicle Speeds

# Safety Analysis

**What data sources are available to analyze crash rates tied to current federal legal limits?**

**Are there any data sources that could be used to analyze crash rates tied to those operating above the legal limit?**

# Safety Analysis

**What models and/or analytical tools are available to evaluate crash rates (e.g, severity and frequency)?**

- **At Current Federal Limits**

- **Above Federal Limits**

# Safety Analysis

**What, if any, concerns or limitations related to prior studies or data sets should be taken under consideration during this study?**

# Compliance Analysis- Method

- (1) Gather and compare violation rates by type
  - CMVs not complying with federal TSW limits

- (2) Gather and compare OS/OW permits by location
  - help identify potential violation areas

- (3) To determine enforcement costs and the effectiveness of the enforcement
  - Assessment data will be specific to the methods used, including on-board monitoring/recording equipment, WIM and weigh station data.

- (4) A separate inventory of all federal laws and regulations that would be affected by a change in federal truck size and/or weight limits will be prepared.

# Compliance Analysis- Data

- Annual Certifications of TSW Enforcement Activities

- Enforcement Costs and Resources

- State Permit Data

- WIM Data

# Compliance Analysis

**Are there any additional comments or suggestions related to the compliance focus of this study?**

# *Remember….*

We are inviting your input up to June 5, 2013.  Please forward any additional comments you have to:

**CTSWStudy@dot.gov**