Warm Mix Asphalt: Leveraging the Benefits

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58th Annual Idaho Asphalt Conference

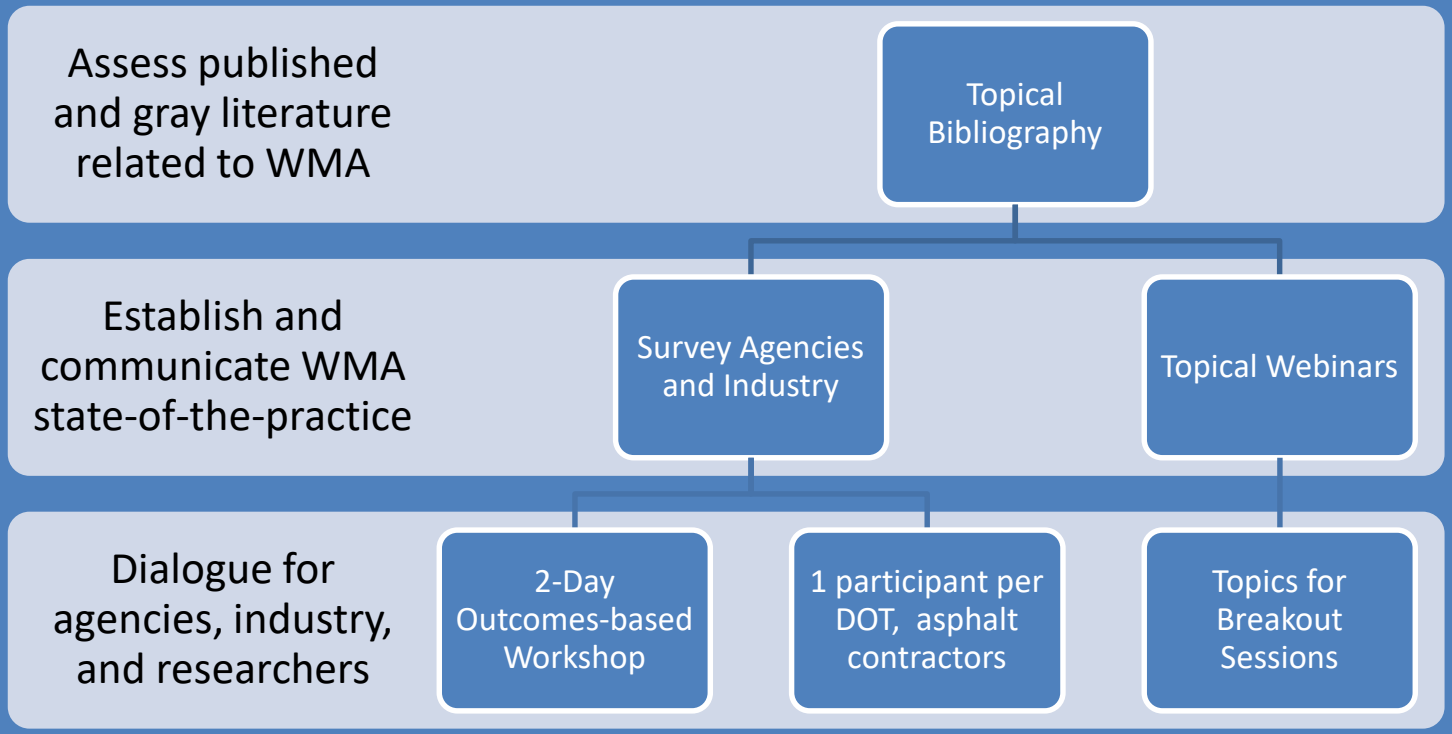
University of Idaho

October 25, 2018

NCHRP Project 20-44(01):

Increasing WMA Implementation by Leveraging the State-of-Knowledge

Project Approach



Warm Mix Briefs

Available online at:
http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectI

NCHRP Project 20-44: Increasing WMA Implementation by Leveraging the State-of-the-Knowledge

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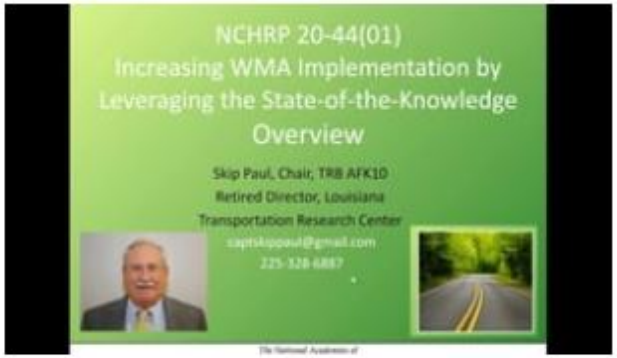

Introduction to NCHRP Series

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NCHRP Project 20-44, Module 1: Overvie...

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1 Following

Survey of Agencies and Industry

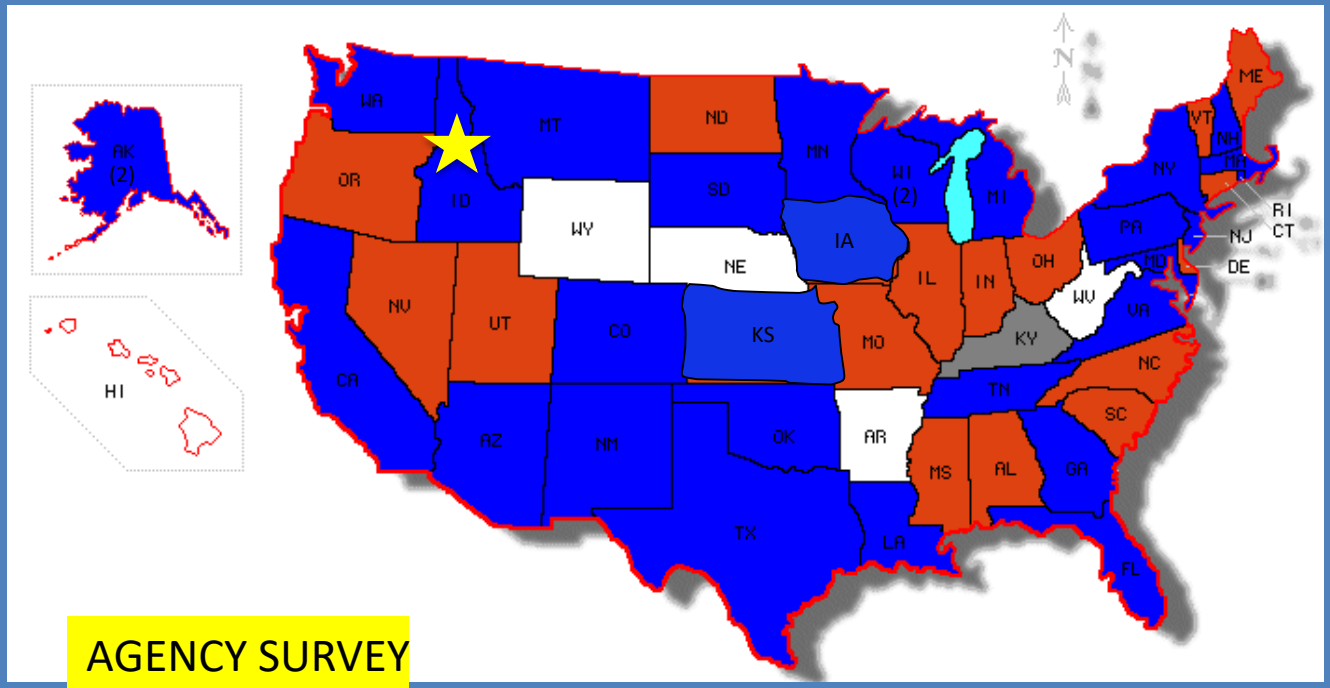
<u>Establish the State-of-the-Practice:</u>

- Definitions of WMA
- Practices related to use and performance of WMA
- Identify barriers to better adoption of tools for WMA implementation
- Identify observed or perceived challenges to increased usage of WMA
- Identify best management practices (BMPs) for successful use of WMA on paving projects

Survey: Idaho Responses (2017)

Key Points:

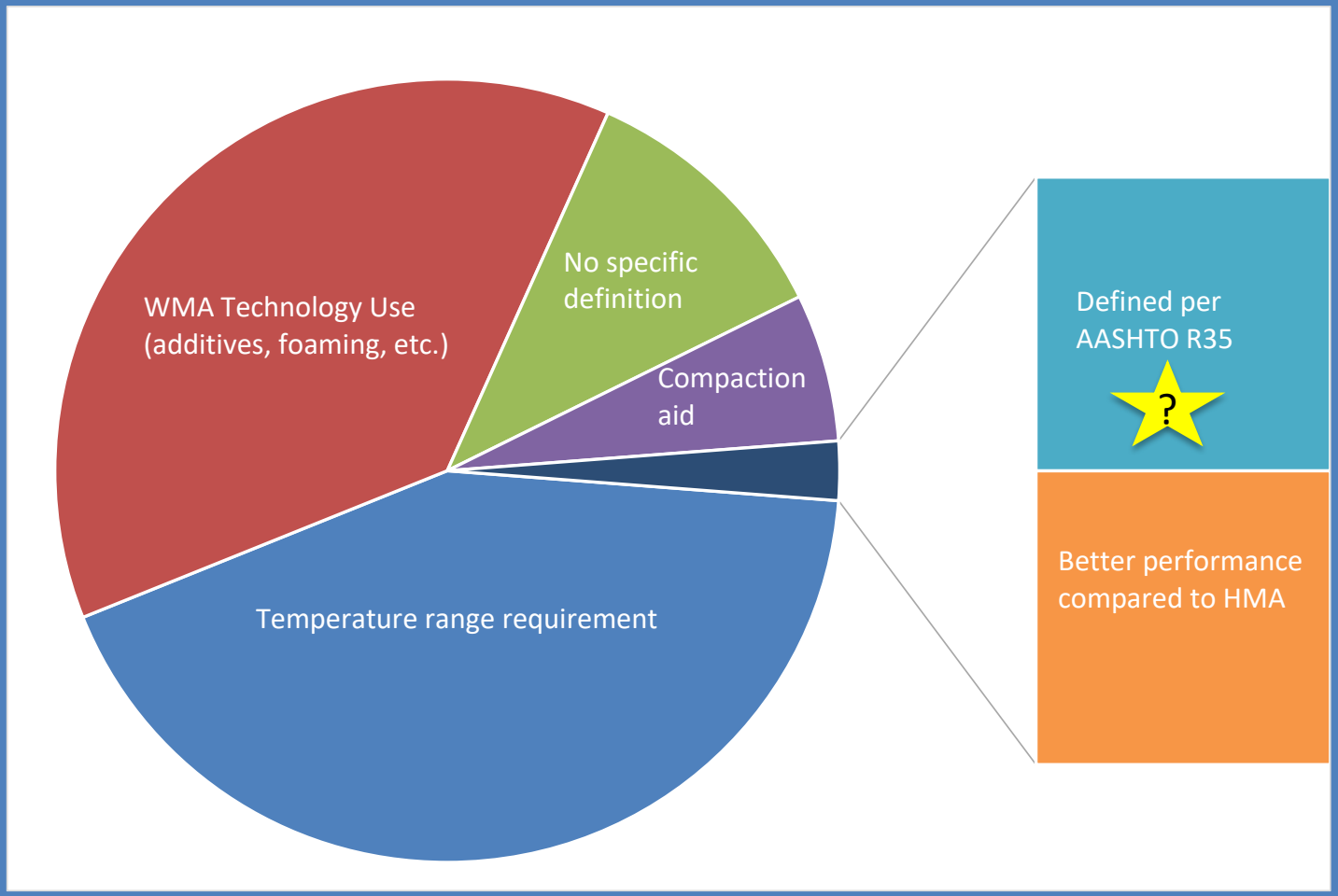
- WMA reported to be < 10% of total asphalt proportion in 2016
- Interest in continuing education programs
- Allow contractor's choice for WMA rather than specifying its use
- Incorporate procedures to show WMA is not that different than HMA



What really is Warm Mix Asphalt?

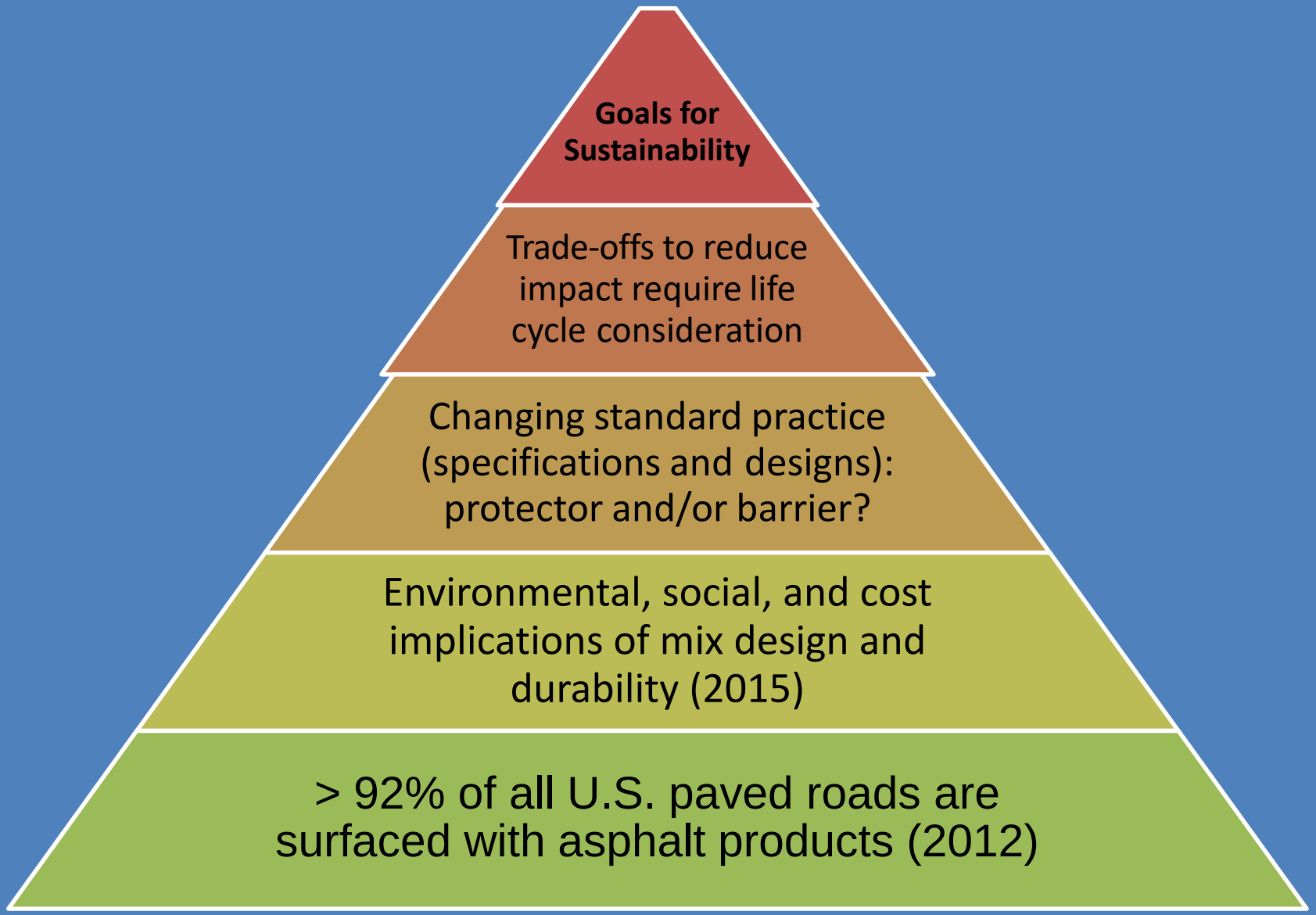
Agency survey revealed…

55 agencies - - 51 different definitions for WMA



Why Capture WMA Usage ?

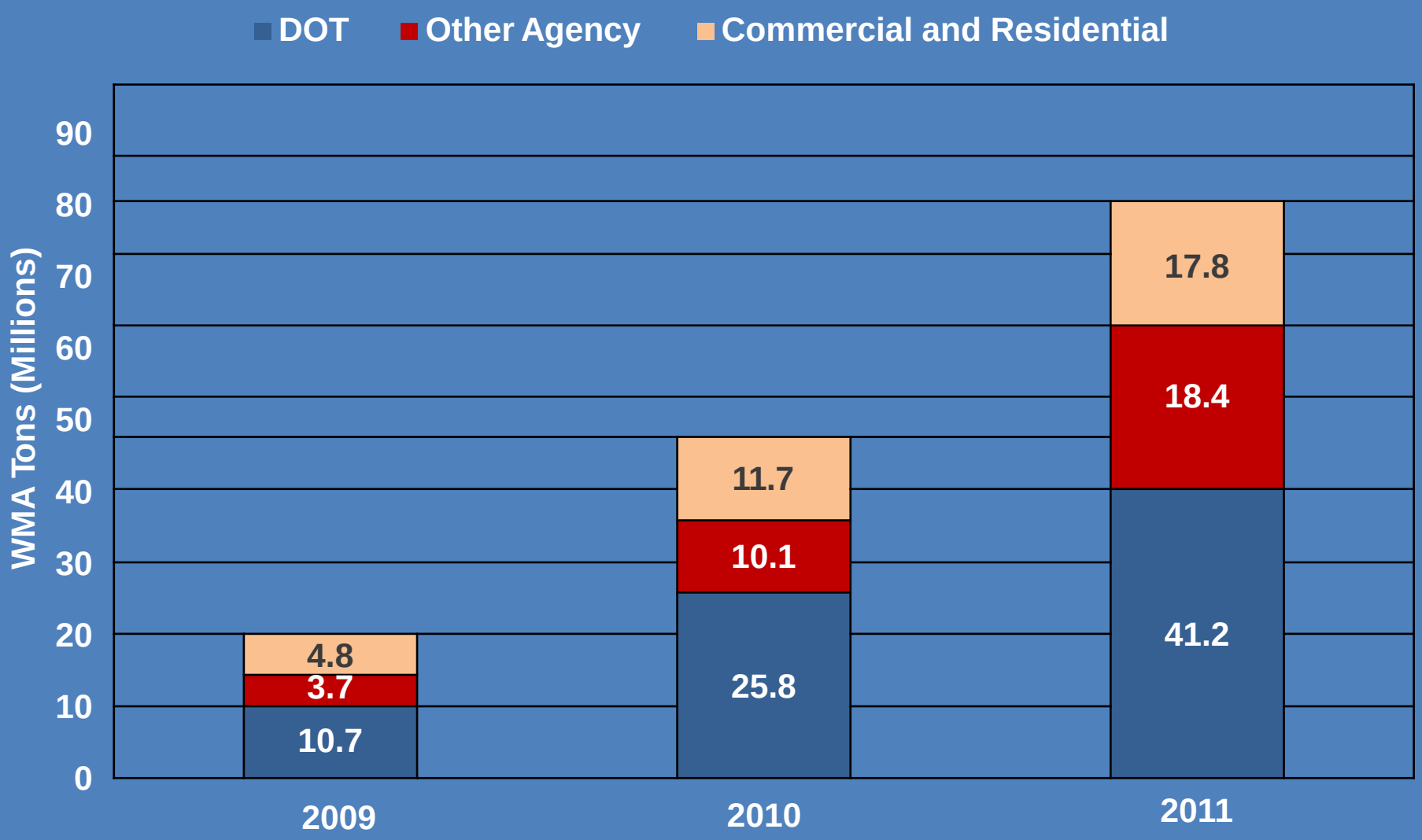
For Consideration…



Driving Factors for Warm Mix Asphalt

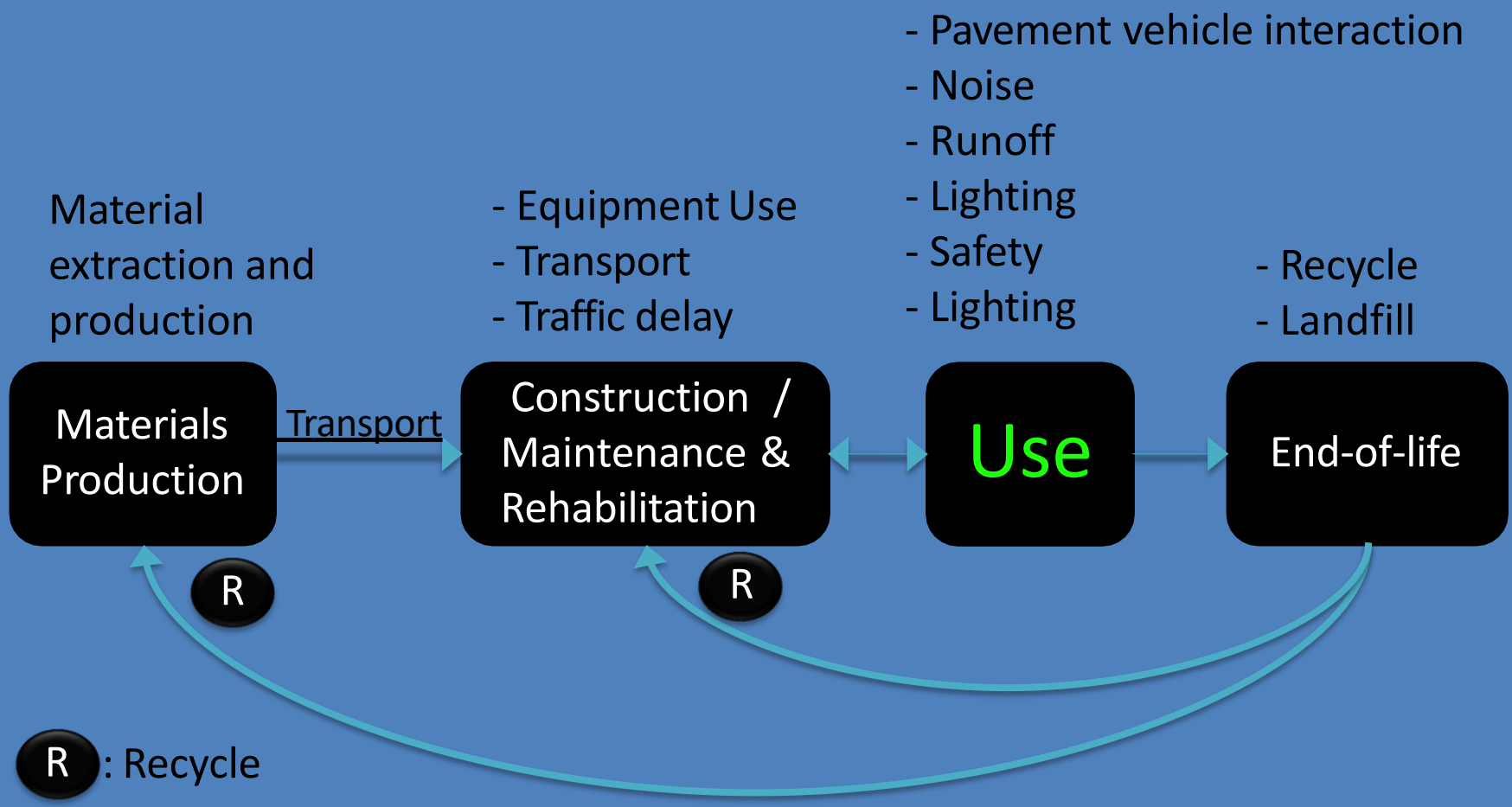
- Environmental & societal concerns
  - NIMBY
  - Reduce haul distances by opening WMA-only plants with reduced temperatures (encourages use of local materials)
- Sustainable development
  - Increase material performance and time between future maintenance and rehabilitation treatments
- Green construction
  - Easily combined with recycled materials
- Reduction of energy consumption
- Reduction in CO_2 emissions
- Reduced worker exposure
  - Faster compaction "get in, get out, stay out"
- Extension of construction season
  - Faster project delivery
  - Reduced user delay costs over time

Increased Use of WMA in US



Hansen and Copeland 2013

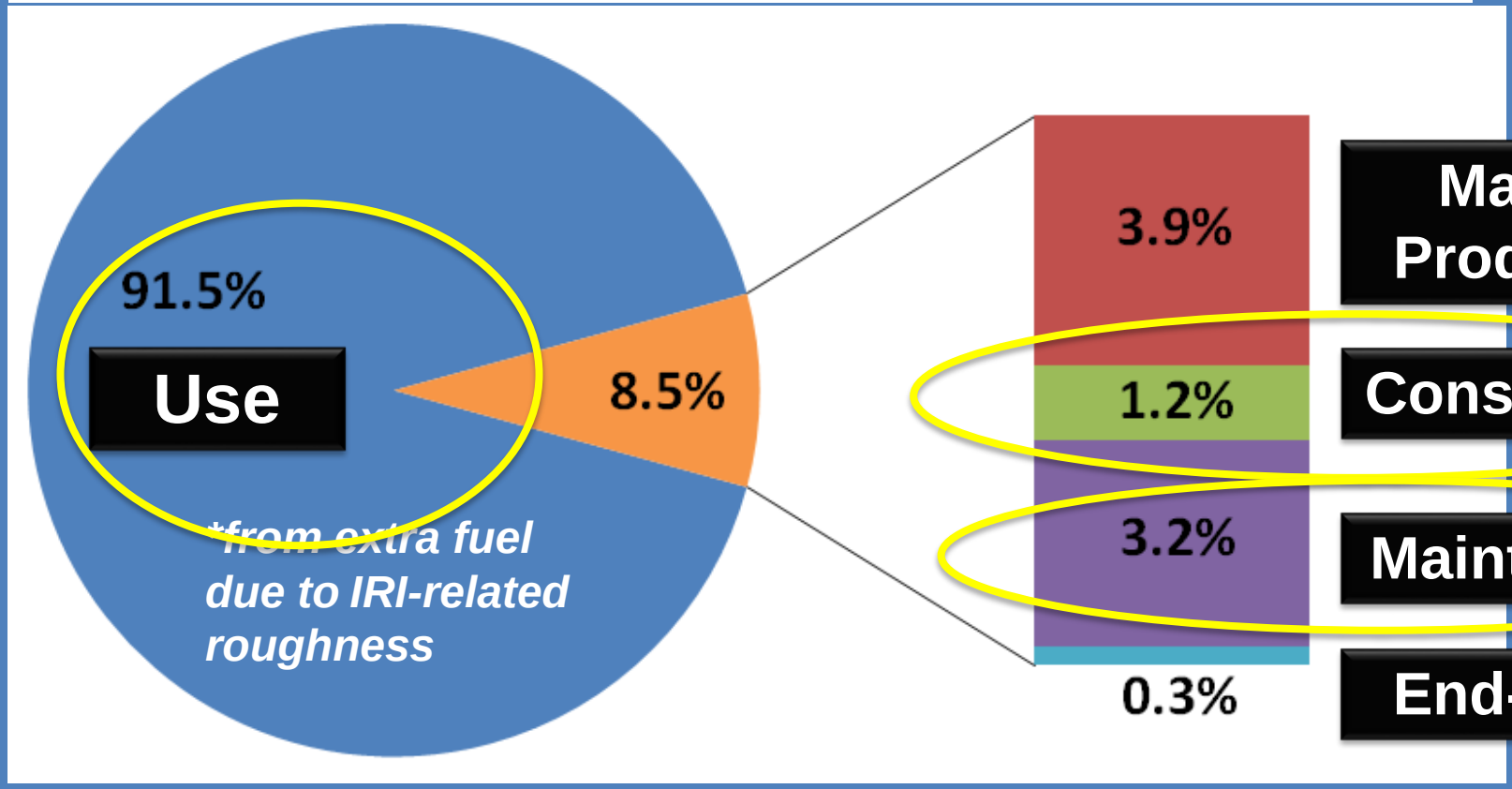
Pavement Life Cycle



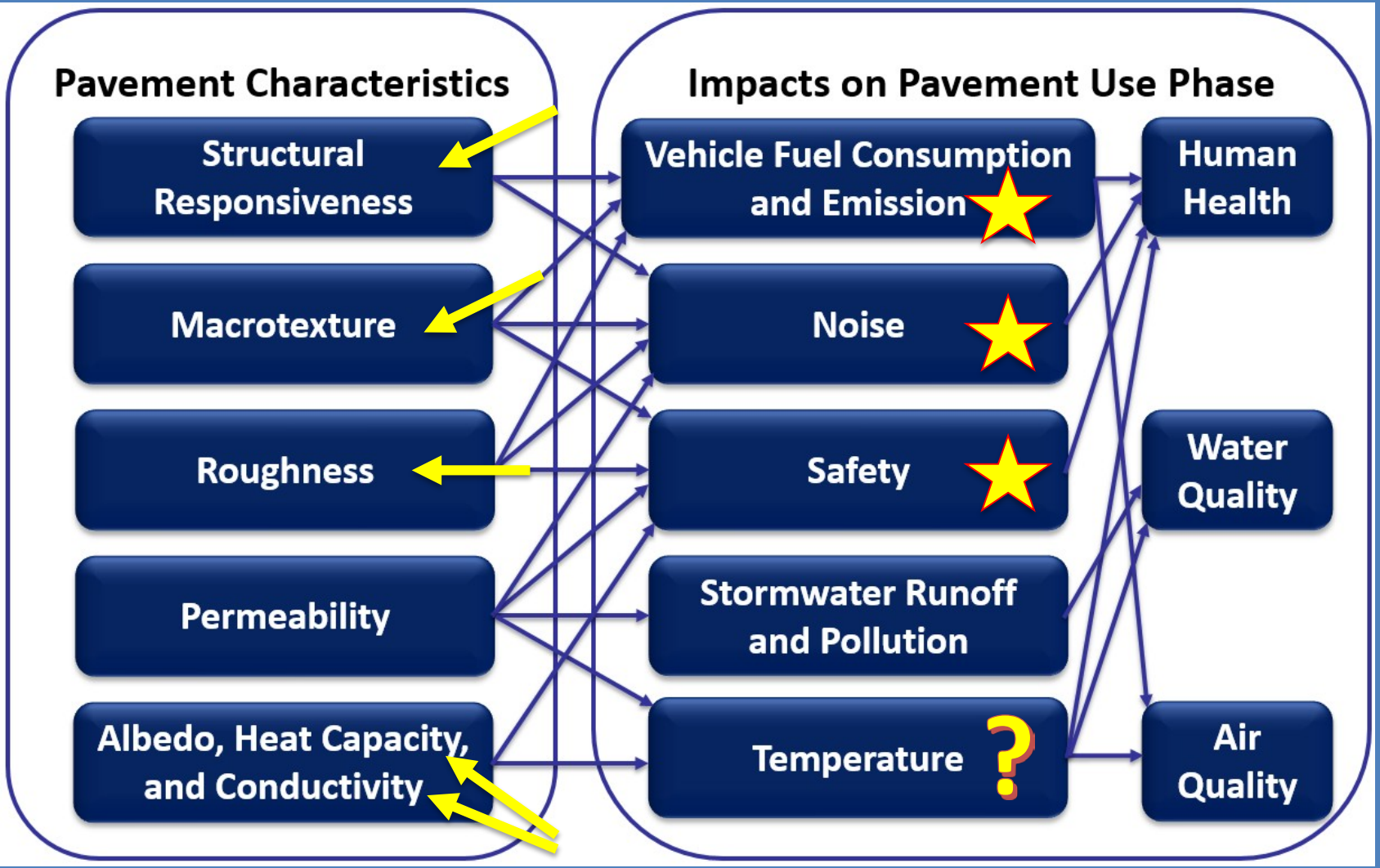
From: Kendall et al, *2010*

No Temperature Drop? No Effect?

Energy Consumed in an Asphalt Pavement Life Cycle
(from FHWA 2015)



WMA & the Use Phase



From: FHWA, *2015*

Driving Factors for Warm Mix Asphalt: *Without Temperature Reduction*

- Environmental & societal concerns
  - Reduce haul distances by opening WMA-only plants with reduced temperatures (encourages use of local materials)
- Sustainable development
  - Increase material performance and time between future maintenance and rehabilitation treatments
- Green construction
  - Easily combined with recycled materials
- Reduction of energy consumption
  - Less compactive effort, drop one roller compactor
- Reduction in CO_2 emissions
- Reduced worker exposure
  - Faster compaction "get in, get out, stay out"
- Extension of construction season
  - Faster project delivery
  - Reduced user delay costs over time

IDEAS for IDAHO

The Challenges…

Agencies

- Limitations with existing specifications
  - Temperature requirements
  - Prescriptive or permissive specifications
    - *Neither type rewards innovation*
- Limitations on allowable technologies

Contractors

- Lack of incentives within existing bid environment
  - *Lowest bid price wins project*
- Logistics of plant production for various customers

Other

- Lack of effective technology transfer tailored to the right audiences
- Long term performance and/or track record not available for all WMA technologies

No cohesive leadership → no motivation!

Production & Construction Challenges

- Fear of the unknown or change to existing techniques, lack of experience with materials
- Aggregate moisture concerns & condensation in silos or baghouses
- Switching between HMA and WMA in production

(different customers = different requests)

Review Bidding Environment

- Provide incentives for using WMA
  - If there is an incentive, verify use of WMA
  - Bid review includes technical points for use of WMA, which could offset the cost of additives & production changes (which results in higher bid costs)

- Create a WMA specific bid or line item
- Challenges with realizing full savings in a low-bid environment
  - Economic advantages may be understated if full production, placement, and performance aren't considered

The Solutions…

More effective training documents for target audiences

- Short online videos, 1-pg targeted briefing documents

Don’t use method or permissive specifications

- Shift to end-result or performance-based specs

Create case studies & a process for agencies to collaborate

- Tie into or expand asset management database for WMA
- Repository for approved product lists and technology updates
- Clearly communicate benefits for local agencies & contractors

WMA in Idaho: Today,… in the Future?

Considerations…

- Is a guide specification enough? WMA item called out specifically?
- Loosen up the spec, incentivize the contract (LEED-type credits)?
- How do local agencies procure asphalt mix?
- What contract types are available for local agencies to use WMA?
- Is the state's APL clearly written for local agencies to access?
- What should the performance criteria be for other spec types?

IDEAS:

- Cooperative efforts at the regional level to track impact (project lists)
- Long term impacts disseminated on fact sheets through LTAP/APA
- Communication between departments within an agency
- Environmental benefits/impacts - joint effort between agencies, contractors, academia
- Database platform and integration for effective monitoring
- Performance metrics: penalties/incentives paid, density, smoothness, public complaints
- Monitor cost savings: equipment use, work zone duration, etc.

EXAMPLE: Quantifying Traffic Delays

Energy and emissions contribution of traffic delays, due to construction activities

- *Often ignored in pavement LCAs*

Impact on environment, due to traffic delays, may be quantified using appropriate tools:

- Traffic simulator to estimate driving schedule under changing roadway capacity

- EPA's MOVES software to calculate additional emissions and energy consumption with changing driving schedules

From: FHWA, *2015*

Vehicle Emissions Simulations

EPA's MOVES

- Emission modeling system for mobile sources
- Energy consumption
- Emissions to air
  - 120+ emissions

EPA's NONROAD

- Emission modeling system for non-road equipment
- Energy consumption
- Emissions to air
  - HC, CO, NOx, PM, SO2, and CO2

From: FHWA, *2015*

LCA Inventory Database

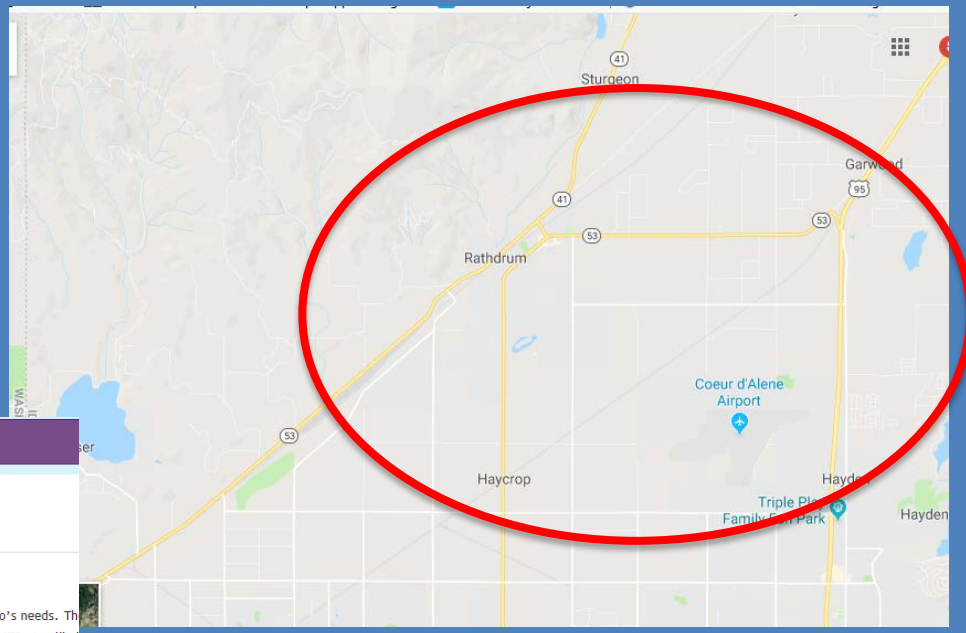
- ✓ Construction equipment
- ✓ Hauling
- ✓ Total use-phase traffic emissions
- ✓ Road related use-phase traffic emissions
- ✓ Congestion & work zone-related emission inventories

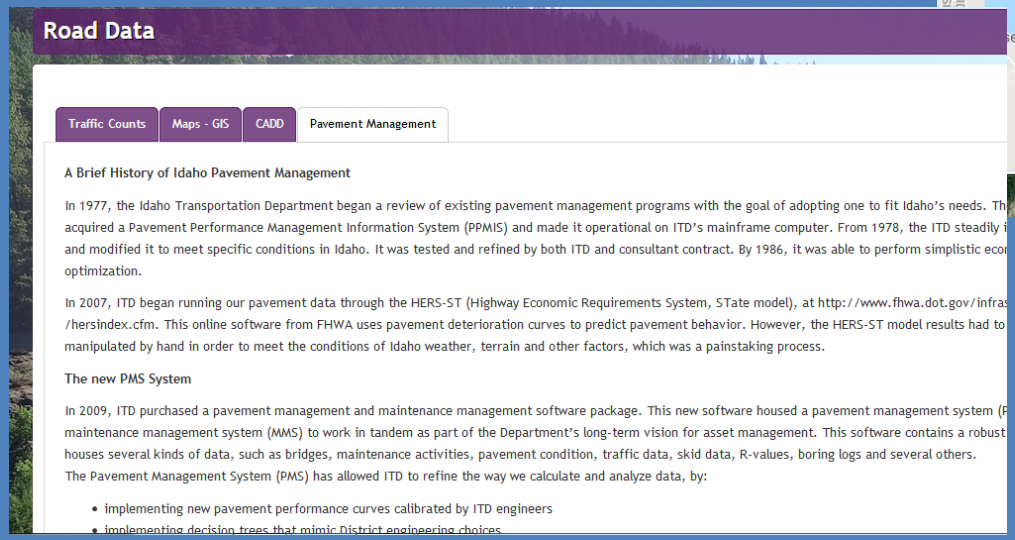
Take Idaho 53 for example…

Near Rathdrum, Idaho

Review ITD Road Data

- Heavy truck count?
- Closest asphalt plant?
- Maintenance schedule?
- Pavement condition history?





Idaho SR53: Case Study for WMA?

Near Rathdrum, Idaho

- Maintenance history & condition ratings
  - Top-down cracking in wheel paths?
  - ✓ WMA = better compaction, less susceptible to TDC

SR-53 Candidate for Tracking Performance of WMA…

- Cost (bid, construction, etc.)
- Haul distance
- Time for constr./user delays
- Compaction information
- Monitor performance, and manual maintenance schedule
- Public complaints & noise
- Safety and IRI over time

NEXT STEPS

- Outreach ideas
  - Provide basic training materials to LTAP
  - Community of practice for WMA users (industry & public and commercial sectors)
  - Grant programs
  - Chief Engineer & District secretary presentations, IAA, other target audiences (pavement preservation & user/producer groups)
  - Contractor outreach/education to customers
  - Local agency coordinators at DOT and construction/maintenance decisionmakers

Talk with your DOT – your thoughts count!

Thank you!!

Idaho Asphalt Contractors & Suppliers

Idaho Transportation Department

University of Idaho!

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