



Using LCA to Evaluate the Sustainability of SMA Mixtures

William R. Vavrik, Ph.D., P.E.
Vice President & Principal Engineer

1st International Conference on
Stone Matrix Asphalt

© 2018 Applied Research Associates, Inc. ARA Proprietary



NATIONAL SECURITY



ENERGY & ENVIRONMENT



INFRASTRUCTURE



HEALTH SOLUTIONS

NUMBER 308

MARCH-APRIL 2017

TR NEWS

Freight Planning

Innovations, Scenarios, and Environmental Justice

Plus:

Safety Culture Lessons from the Offshore Oil Industry

Mileage-Based User Fees: What Does the Public Think?

Driverless Cars: The Need for Interdisciplinary Research

TRANSPORTATION RESEARCH BOARD
The National Academies of
SCIENCES • ENGINEERING • MEDICINE

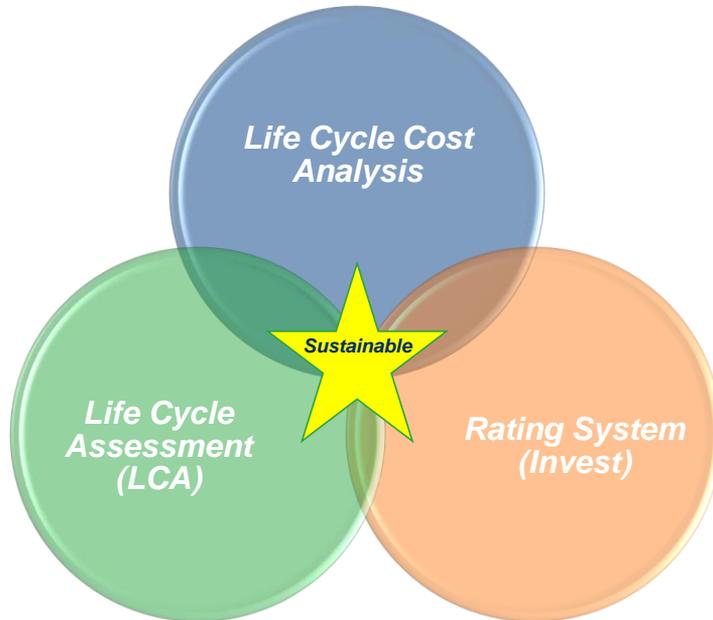
TRB 99th Annual Meeting
Photo: iStock.com

2014 Statistics were focused on recycling



Nearly 1.4 million tons of recycled concrete, asphalt and aggregate in the construction of new roads – enough to build a nearly 2,700-mile bike path from Boston to San Francisco





© 2017 Applied Research Associates, Inc. ARA Proprietary



Rating Systems are Different From LCA

The focus is increasing sustainability

Rating System	Life Cycle Assessment
Qualitative	Quantitative
Social, Economic, and Environmental	Environmental
Rates a system	Typically for a product (eg. pavement, car, etc.)
Result is Points	Result is Detailed Inputs and Impacts



© 2017 Applied Research Associates, Inc. ARA Proprietary

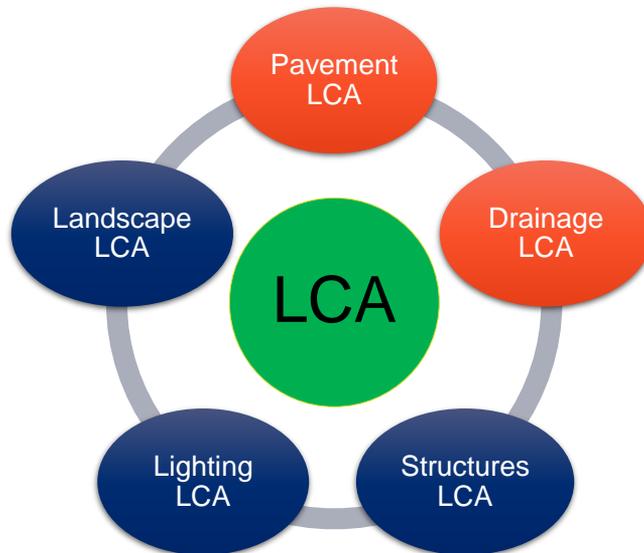


You get what you measure

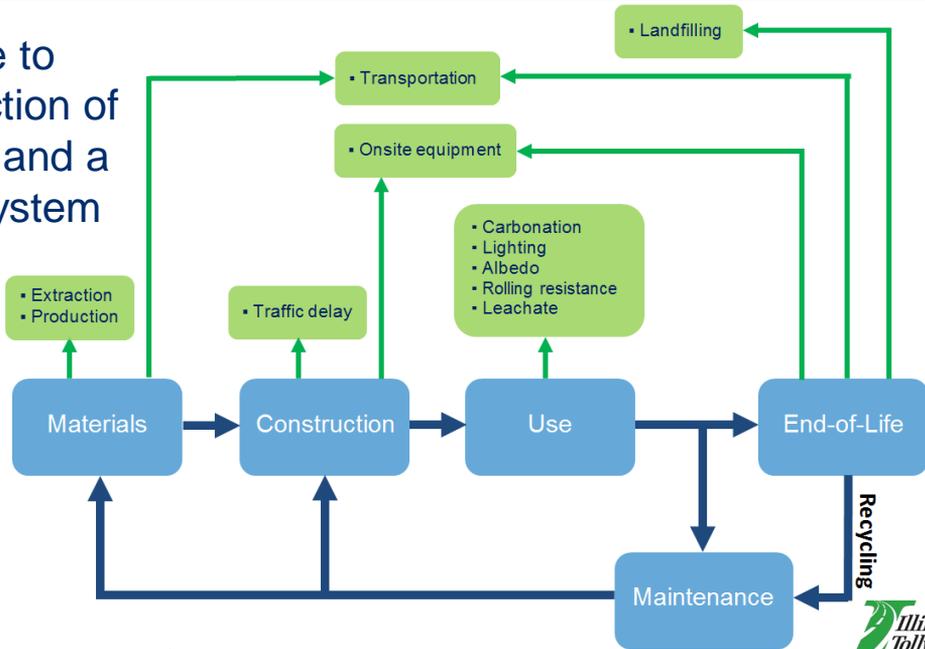
- All aspects of the Tollway program
- Report status and progress to customers
- Use a common language



Tollway LCA is Full Roadway System



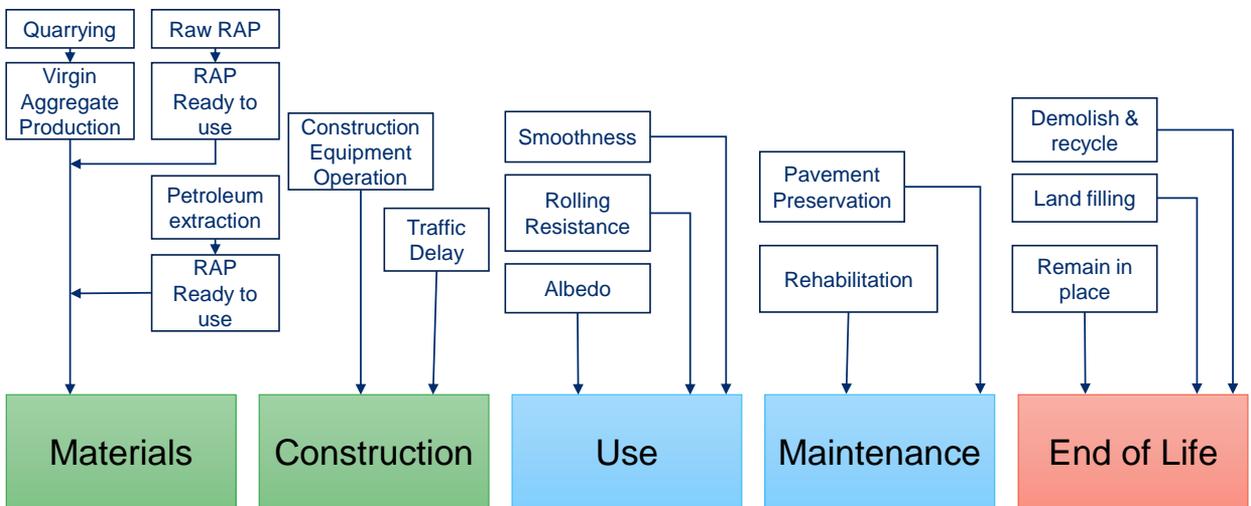
LCA is cradle to grave interaction of environment and a production system



© 2017 Applied Research Associates, Inc. ARA Proprietary



LCA Framework is Comprehensive



© 2017 Applied Research Associates, Inc. ARA Proprietary



Understanding LCA Impacts for SMA

SMA impacts vary across phases

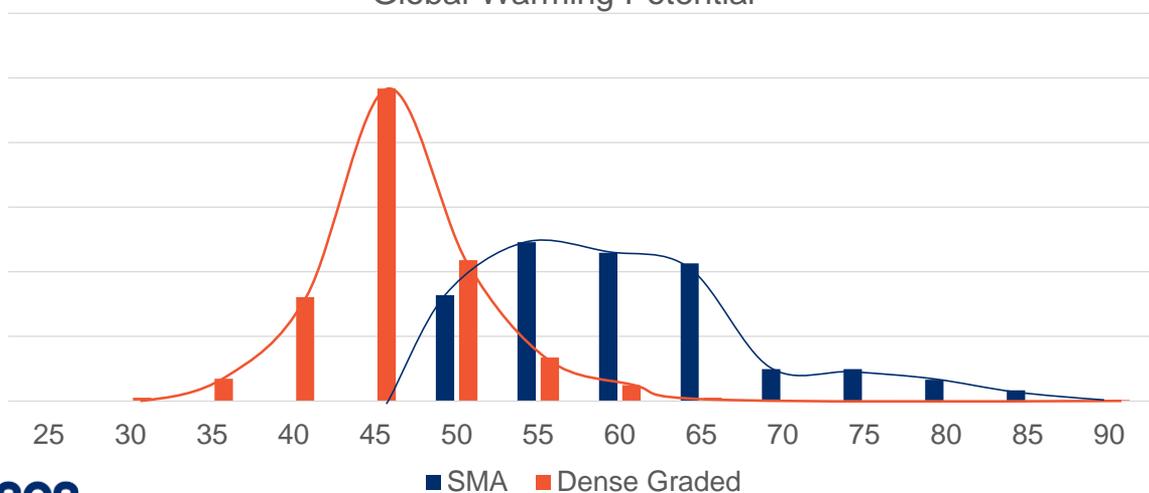
Use phase impacts are most significant

- Smoothness
- Rolling resistance
- Extended Life



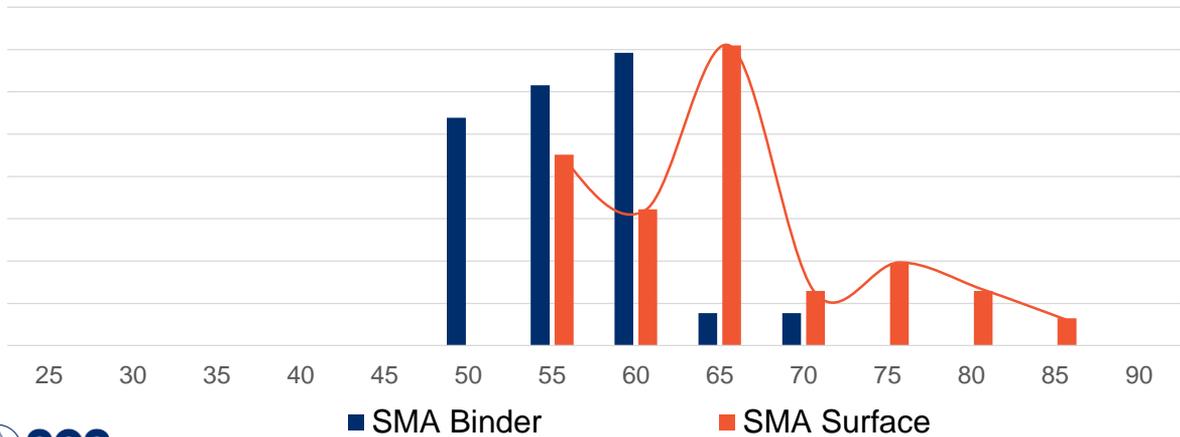
There is a difference between SMA and Dense Graded

Global Warming Potential



There is a difference between binder and surface mixes

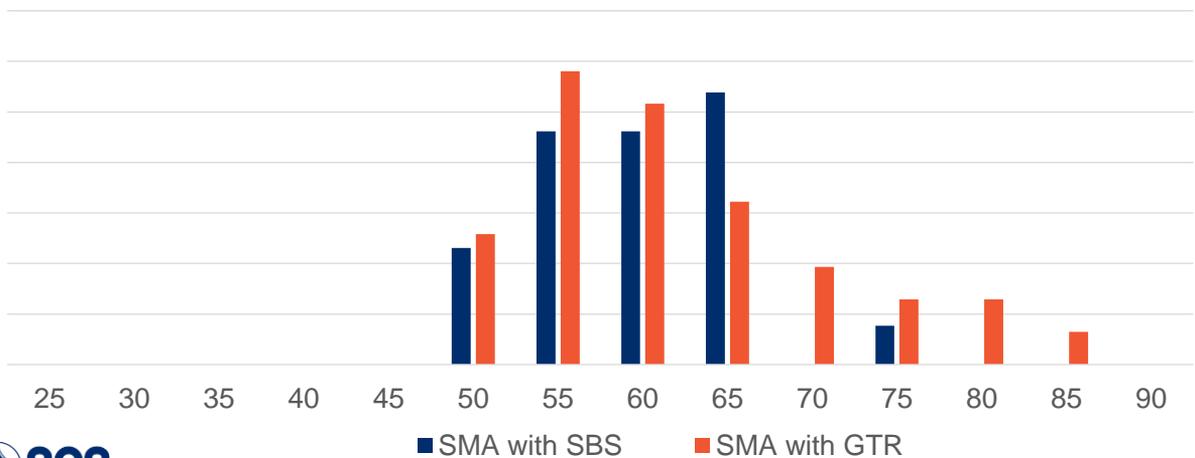
Global Warming Potential



© 2017 Applied Research Associates, Inc. ARA Proprietary

Similar impacts of GTR or SBS

Global Warming Potential



© 2017 Applied Research Associates, Inc. ARA Proprietary

A bit about a few of the factors

Haul distance to the plant drives impact

- Mixes ranged from 92 to 1,211 miles to get raw materials
- Typically ~500 miles of trucking to get all materials to plant

Total recycle content drives impact (if recycled is close)

- Recycled binder replacement from 0 to 48%

In summary...

SMA is most valuable because of the extension of life

SMA mixes can be constructed with low impacts

Recycling matters

Haul distances matter

Questions



INNOVATIVE SOLUTIONS TO COMPLEX PROBLEMS



Bill Vavrik, Ph.D., P.E.
V.P. – Transportation
Office: 217.356.4500
Cell: 217.778.0041
wwavrik@ara.com

