REDEFINING VALUE
SUSTAINABILITY AND RESILIENCE

IAPA 85TH ANNUAL CONFERENCE
MARCH 15, 2022

JOSEPH SHACAT, DIRECTOR OF SUSTAINABLE PAVEMENTS

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- Trade Association representing asphalt industry
  - Mix producers, paving contractors, material suppliers, consultants

- NAPA's Mission
  - Support
  - Advocate
  - Advance

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Let's start with Sustainability

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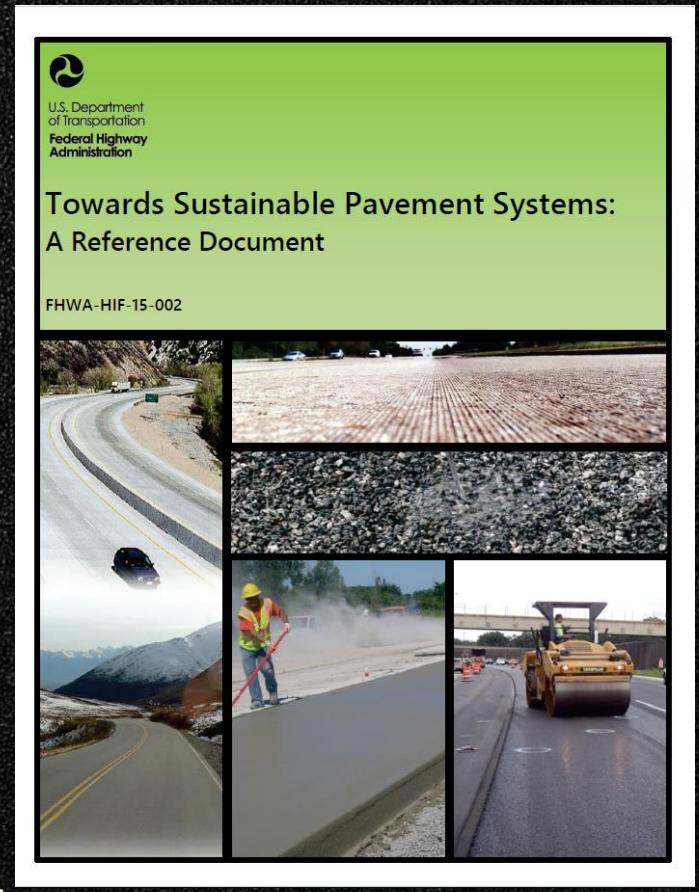
What is a sustainable pavement? FHWA says…

Sustainable pavements should:

- Achieve the **engineering goals** for which they were constructed
- Preserve and (ideally) restore surrounding **ecosystems**
- Use financial, human, and environmental **resources** economically
- Meet **human needs** such as health, safety, equity, employment, comfort, and happiness



https://www.fhwa.dot.gov/pavement/sustainability/hif15002/hif15002.pdf

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Triple Bottom Line of Sustainability

As applied to pavements:

Economic

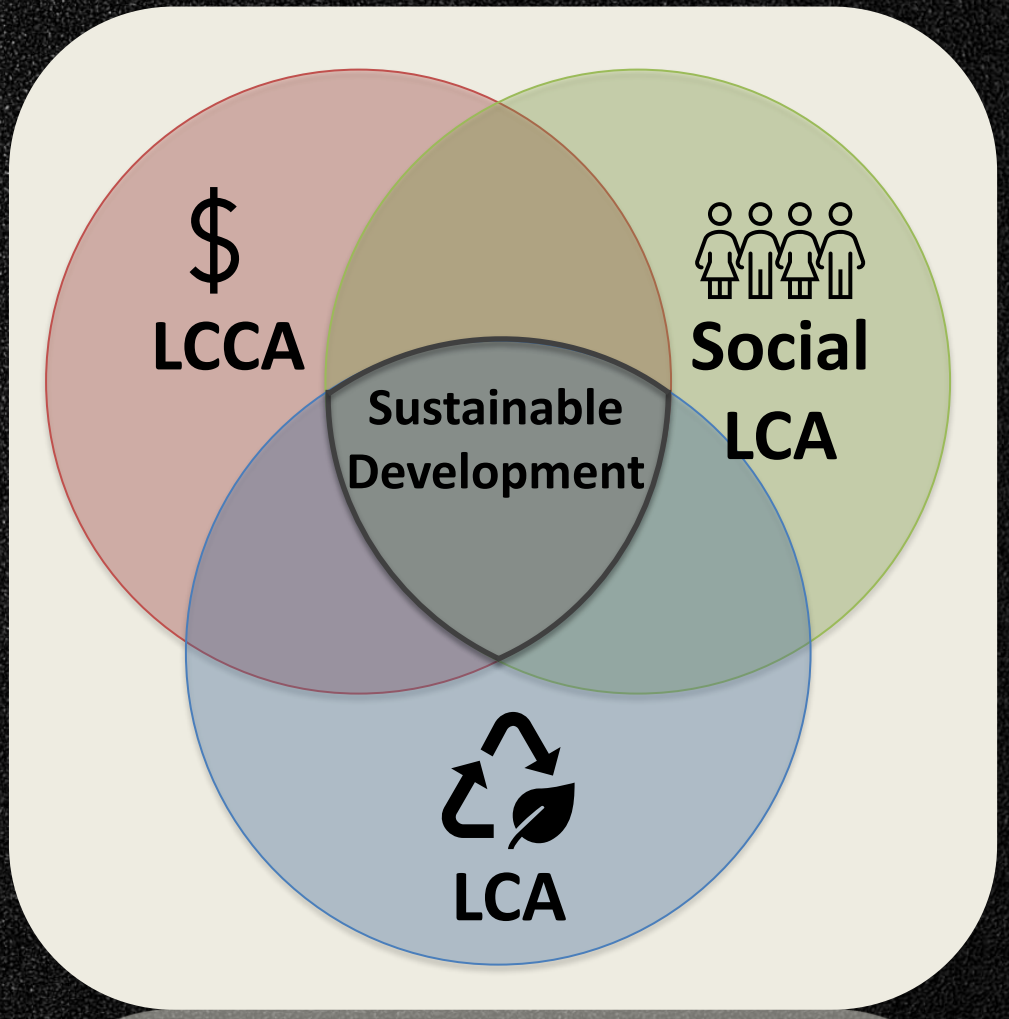
- Agency & User costs
- Benefit-Cost Analysis

Social

- Safety (skid resistance)
- Work force

Environmental

- Emissions
- Runoff
- Materials (Circularity)



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Attitudes are Changing

More than half of young people surveyed think 'humanity is doomed' due to climate change

Last Updated: Dec. 11, 2021 at 10:53 a.m. ET
First Published: Dec. 10, 2021 at 1:18 p.m. ET

By Rachel Koning Beals

23

Three-quarters of respondents under age 25 said they believe 'the future is frightening' in Lancet-published global survey

https://www.marketwatch.com/story/more-than-half-of-young-people-surveyed-think-humanity-is-doomed-due-to-climate-change-11639160312

CNBC MARKETS BUSINESS INVESTING TECH POLITICS CNBC TV WATCHLIST CRAMER PRO

Gen Z grew up with climate change. Now it's starting to have an effect on their career choices

PUBLISHED THU, NOV 12 2020•10:00 AM EST | UPDATED THU, NOV 12 2020•3:51 PM EST

Amanda Mier

SHARE

https://www.cnbc.com/2020/11/12/gen-z-grew-up-with-climate-change-now-its-affecting-career-choices.html

The Road Forward

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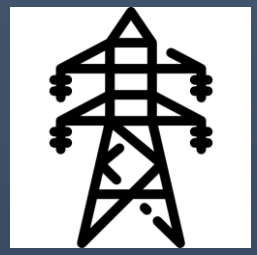
Vision: Sustainable communities and commerce, connected by net zero carbon emission asphalt pavements

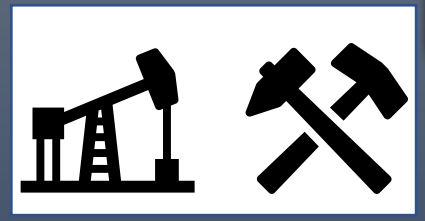
Mission: Engage, educate, and empower the U.S. asphalt community to produce and construct net zero carbon emission asphalt pavements

Production and Construction

Electricity



Net Zero Strategy



Supply Chain

Quality, Durability, Longevity, Efficiency


SEQUESTERED
THE FUN GAME
THAT HELPS YOU LEARN
CLIMATE CHANGE
TERMINOLOGY!
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AsphaltPavement.org/Forward

Customers Want to Reduce Embodied Carbon

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Understanding Carbon

Embodied Carbon

Manufacture, transport and installation of construction materials

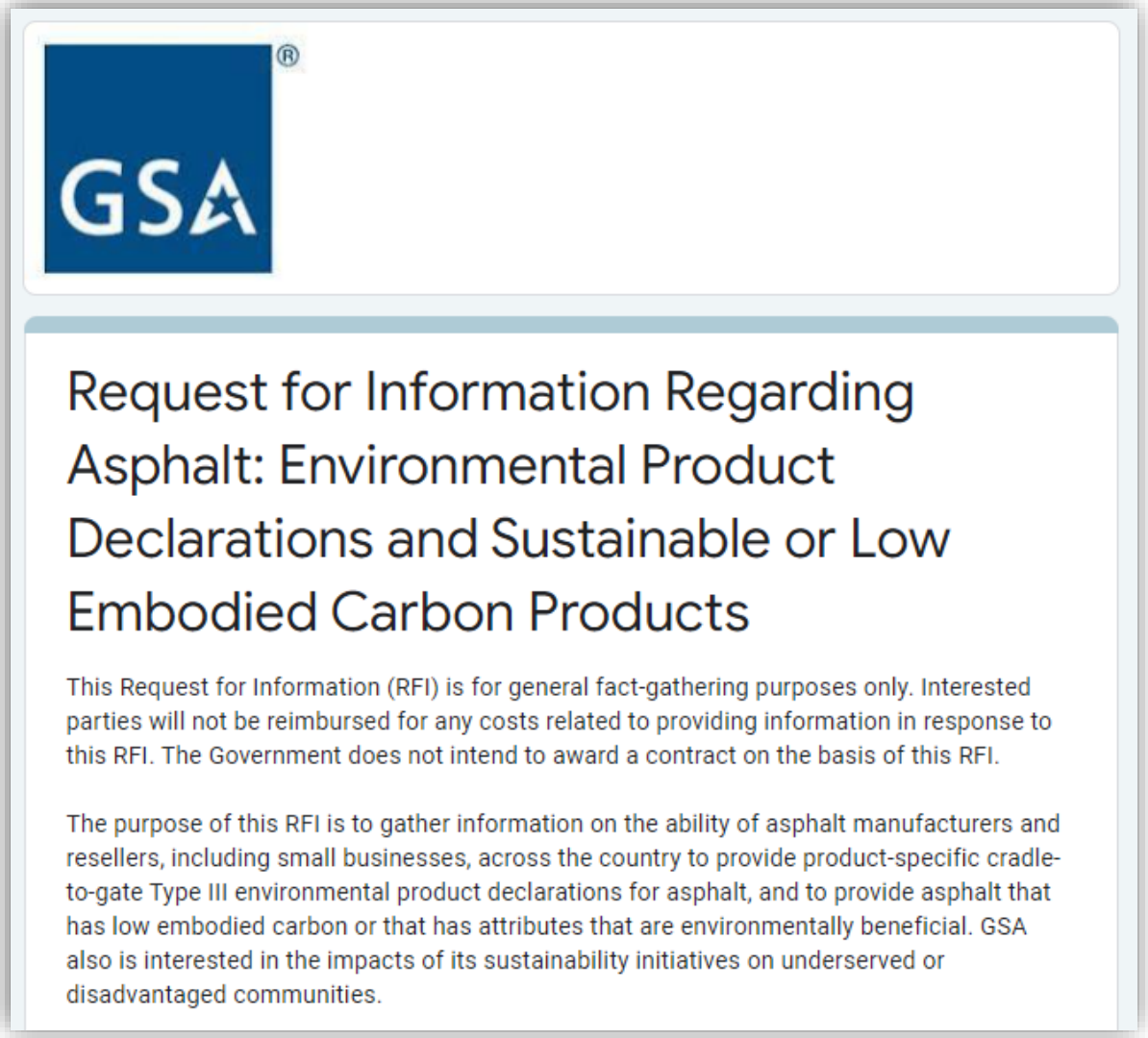
Operational Carbon

Building Energy Consumption

https://www.architects.org/news/building-a-low-carbon-future-reducing-embodied-carbon-in-the-built-environment

Federal Action on Embodied Carbon

- **GSA is looking for sustainable and low embodied carbon asphalt products**
- **GSA to pilot low embodied carbon asphalt pavement program**
- **How is "low embodied carbon" defined?**



GSA®

Request for Information Regarding Asphalt: Environmental Product Declarations and Sustainable or Low Embodied Carbon Products

This Request for Information (RFI) is for general fact-gathering purposes only. Interested parties will not be reimbursed for any costs related to providing information in response to this RFI. The Government does not intend to award a contract on the basis of this RFI.

The purpose of this RFI is to gather information on the ability of asphalt manufacturers and resellers, including small businesses, across the country to provide product-specific cradle-to-gate Type III environmental product declarations for asphalt, and to provide asphalt that has low embodied carbon or that has attributes that are environmentally beneficial. GSA also is interested in the impacts of its sustainability initiatives on underserved or disadvantaged communities.

Quantifying Embodied Carbon

- **Environmental Product Declaration (EPD)**
  - **Quantified** environmental information on the **life cycle** of a product to enable **comparisons** between products fulfilling the **same function***
- **"Nutrition label" for environmental impacts**
- **Independently verified**

EPD "Nutrition" Label

Your Building Product

Amount per Unit

LCA IMACT MEASURES	TOTAL
Primary Energy (MJ)	12.4
Global Warming Potential (kg CO^2 eq)	0.96
Ozone Depletion (kg CFC- 11 eq)	1.80E-08
Acidification Potential (mol H^+ eq)	0.93
Eutrophication Potential (kg N^- eq)	6.43E-04
Photo-Oxidant Creation Potential (kg 03 eq)	0.121

Your Product's Ingredients: Listed Here

https://westcoastclimateforum.com/cfpt/concrete/strategy1

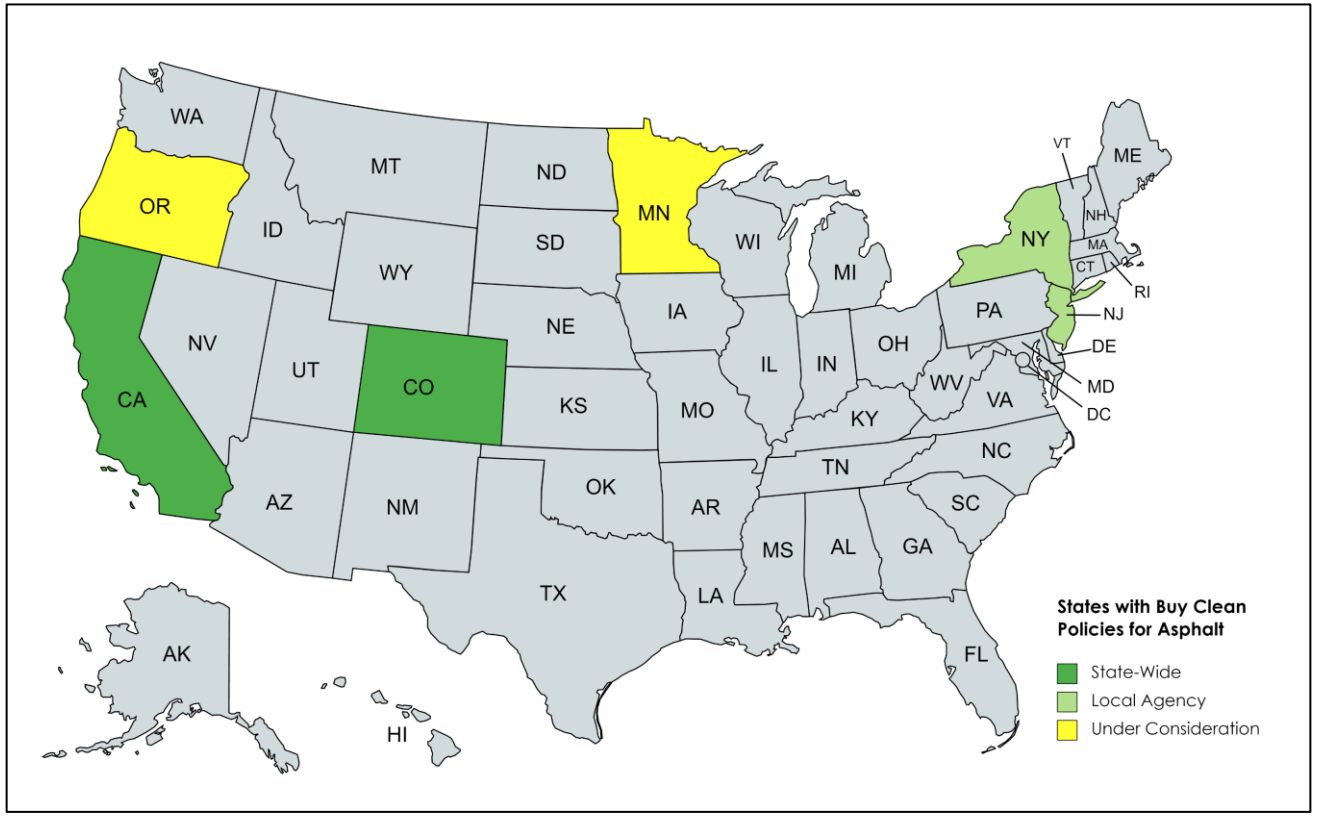
*Source: ISO 14025:2006. **EPDs from different Product Categories should NOT be compared to each other.**

“Buy Clean” Legislation

Jurisdictions with Buy Clean policies that include asphalt mixtures

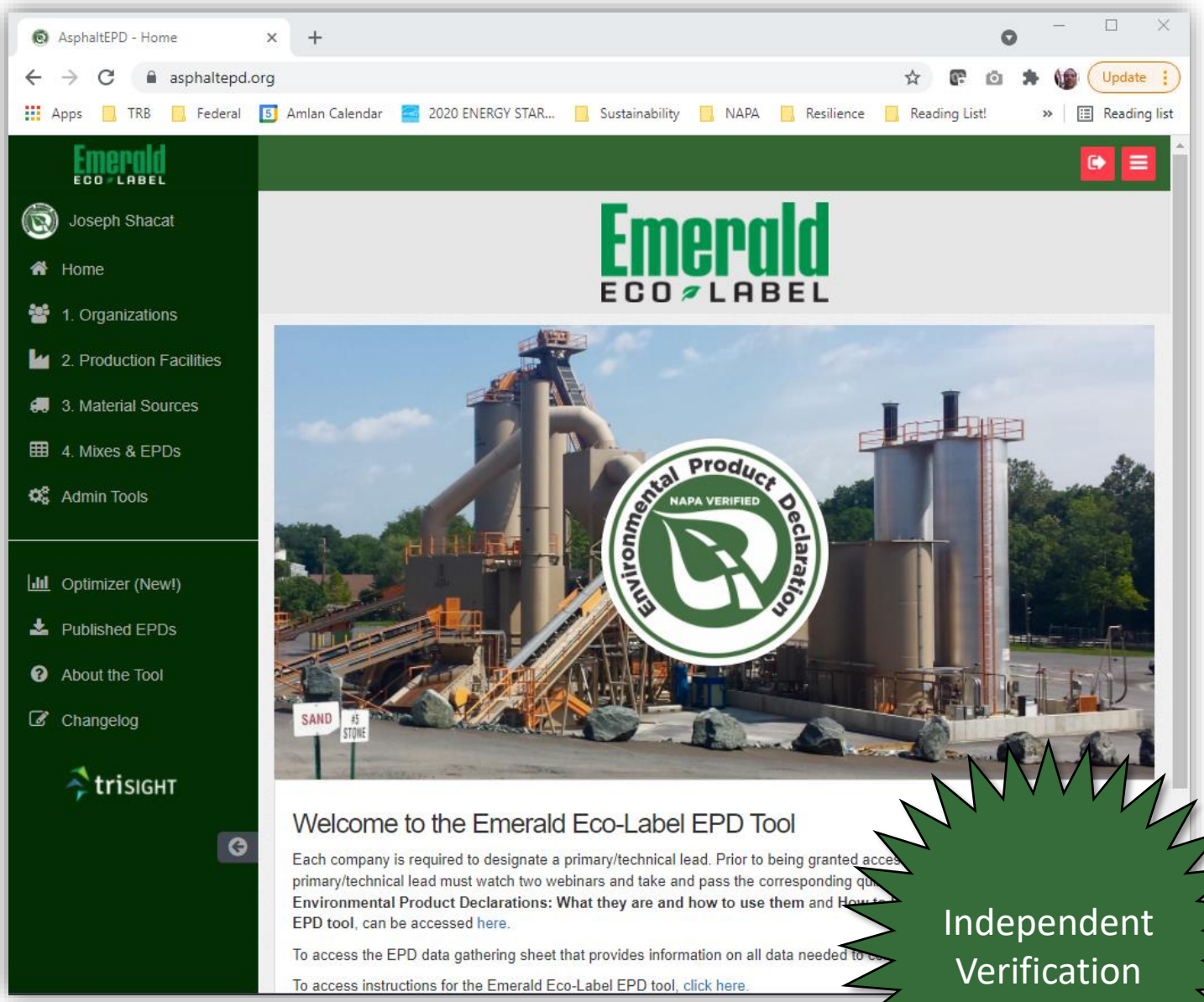
- Caltrans
- Colorado
- Port Authority of New York and New Jersey
- Oregon, Minnesota, other states are considering policies

- **Federal Govt. is establishing a Buy Clean Task Force**
  - GSA to pilot EPDs for projects funded by Infrastructure Act (IIJA)



Emerald Eco-Label Software

- NAPA's web-based **software tool**
- Asphalt mix producers use it to develop **verified EPDs**
- EPDs are **plant-specific** & **mix-specific**
- Can be used for **asphalt plants** located in the U.S.
- **Simplified process** that saves mix producers time and money
- **Version 2 launches April 1, 2022**

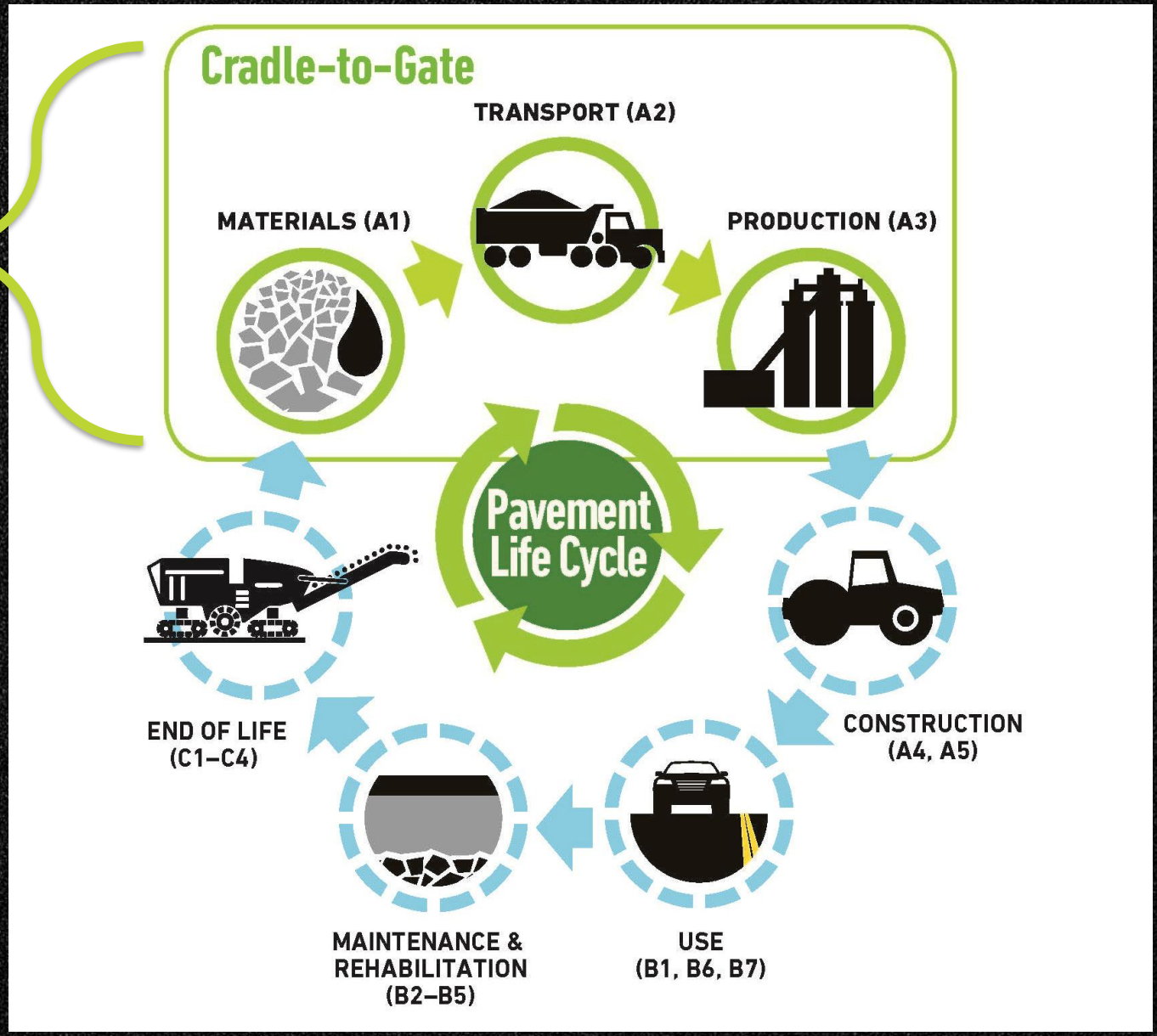


Independent Verification

Pavement Life Cycle

EPDs are Cradle-to-Gate

Cradle-to-Cradle



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An Environmental Product Declaration for Asphalt Mixtures

TABLE 4. LIFE CYCLE IMPACT INDICATORS

ACRONYM	INDICATOR	UNIT	QUANTITY PER METRIC TONNE ASPHALT MIXTURE (PER SHORT TON ASPHALT MIXTURE)			
			MATERIALS (A1)	TRANSPORT (A2)	PRODUCTION (A3)	TOTAL (A1-A3)
GWP-100	*Global warming potential, incl. biogenic CO2*	*kg CO2 Equiv.*	*26.90 (24.40)*	*4.39 (3.99)*	*23.32 (21.15)*	*54.61 (49.54)*
ODP	*Ozone depletion potential*	*kg CFC-11 Equiv.*	*1.52e-08 (1.38e-08)*	*2.65e-08 (2.41e-08)*	*6.24e-08 (5.66e-08)*	*1.04e-07 (9.45e-08)*
EP	*Eutrophication potential*	*kg N Equiv.*	*7.21e-03 (6.54e-03)*	*1.31e-03 (1.19e-03)*	*2.38e-03 (2.16e-03)*	*1.09e-02 (9.89e-03)*
AP	*Acidification potential*	*kg SO2 Equiv.*	*7.82e-02 (7.09e-02)*	*2.24e-02 (2.03e-02)*	*4.23e-02 (3.84e-02)*	*1.43e-01 (1.30e-01)*
POCP	*Photochemical ozone creation potential*	*kg O3 Equiv.*	*1.63 (1.48)*	*0.72 (0.65)*	*1.25 (1.14)*	*3.61 (3.27)*

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What is a Sustainable Pavement Material?

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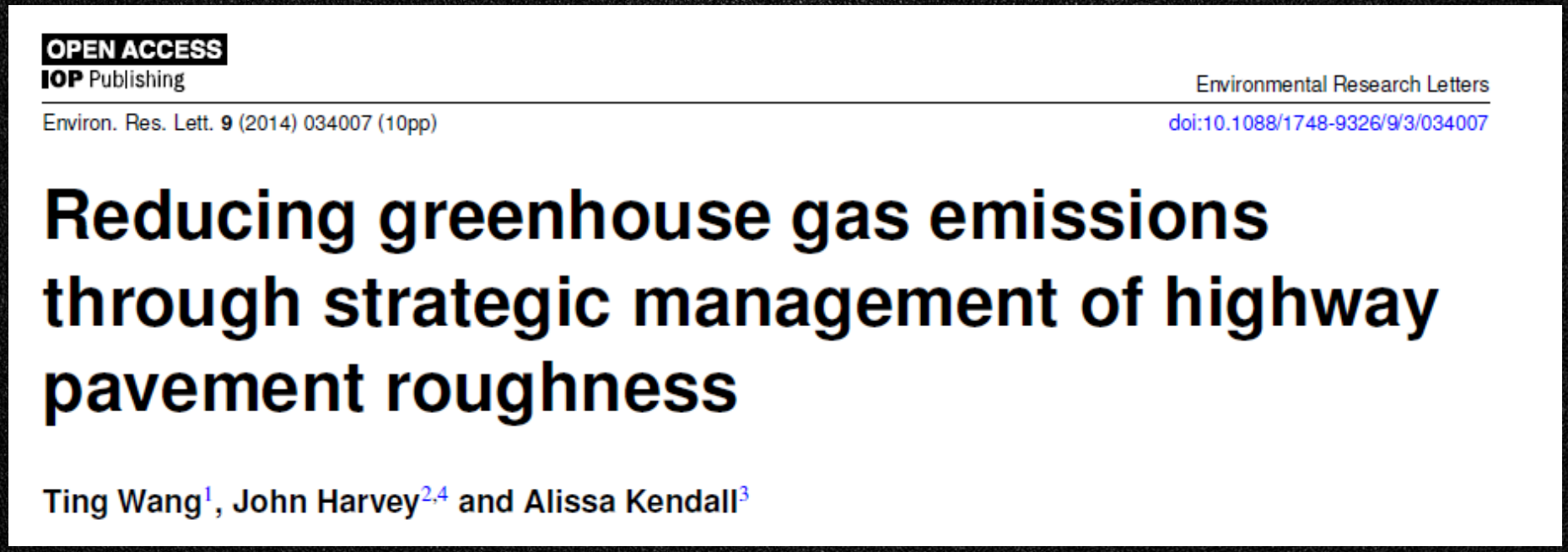
NAPA's Advocacy Focus

- Smoothness
- Recyclability and RAP
- WMA
- Perpetual Pavements
- Speed of Construction

Infrastructure, Investment, and Jobs Act (IIJA)

Carbon Reduction Program

- $6.4 billion program to reduce transportation emissions
  - Smoothness
  - What about low carbon materials?



OPEN ACCESS
IOP Publishing

Environmental Research Letters

Environ. Res. Lett. **9** (2014) 034007 (10pp)

doi:10.1088/1748-9326/9/3/034007

Reducing greenhouse gas emissions through strategic management of highway pavement roughness

Ting Wang[1], John Harvey[2,4] and Alissa Kendall[3]

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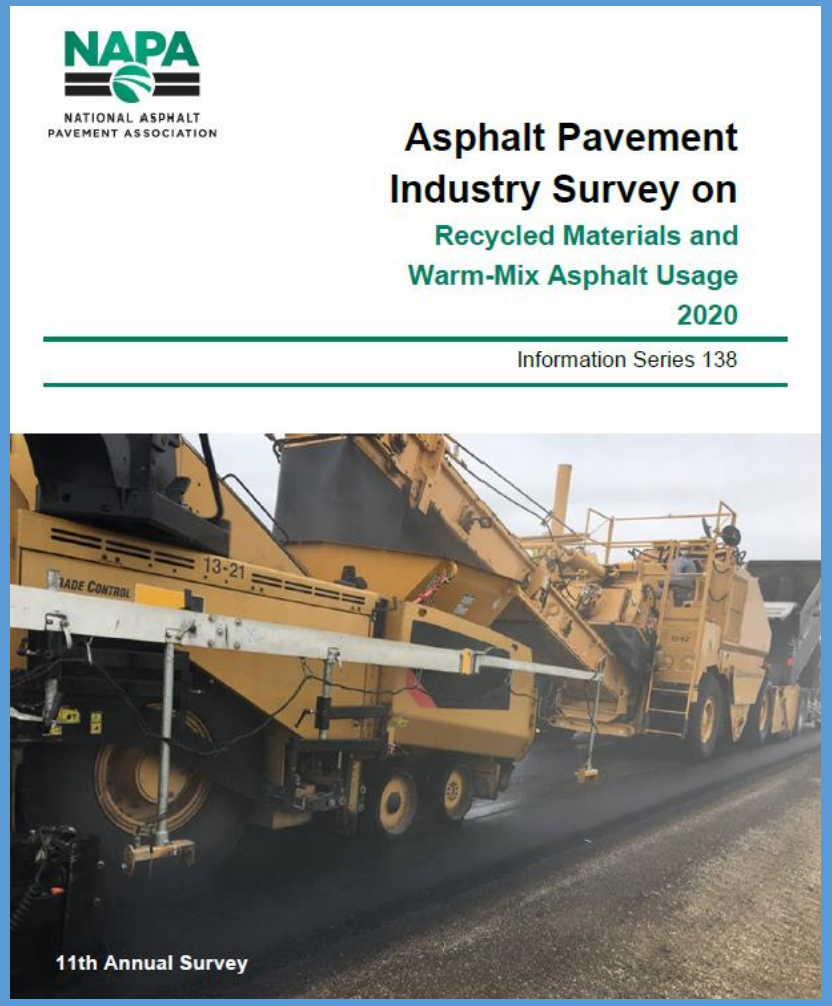
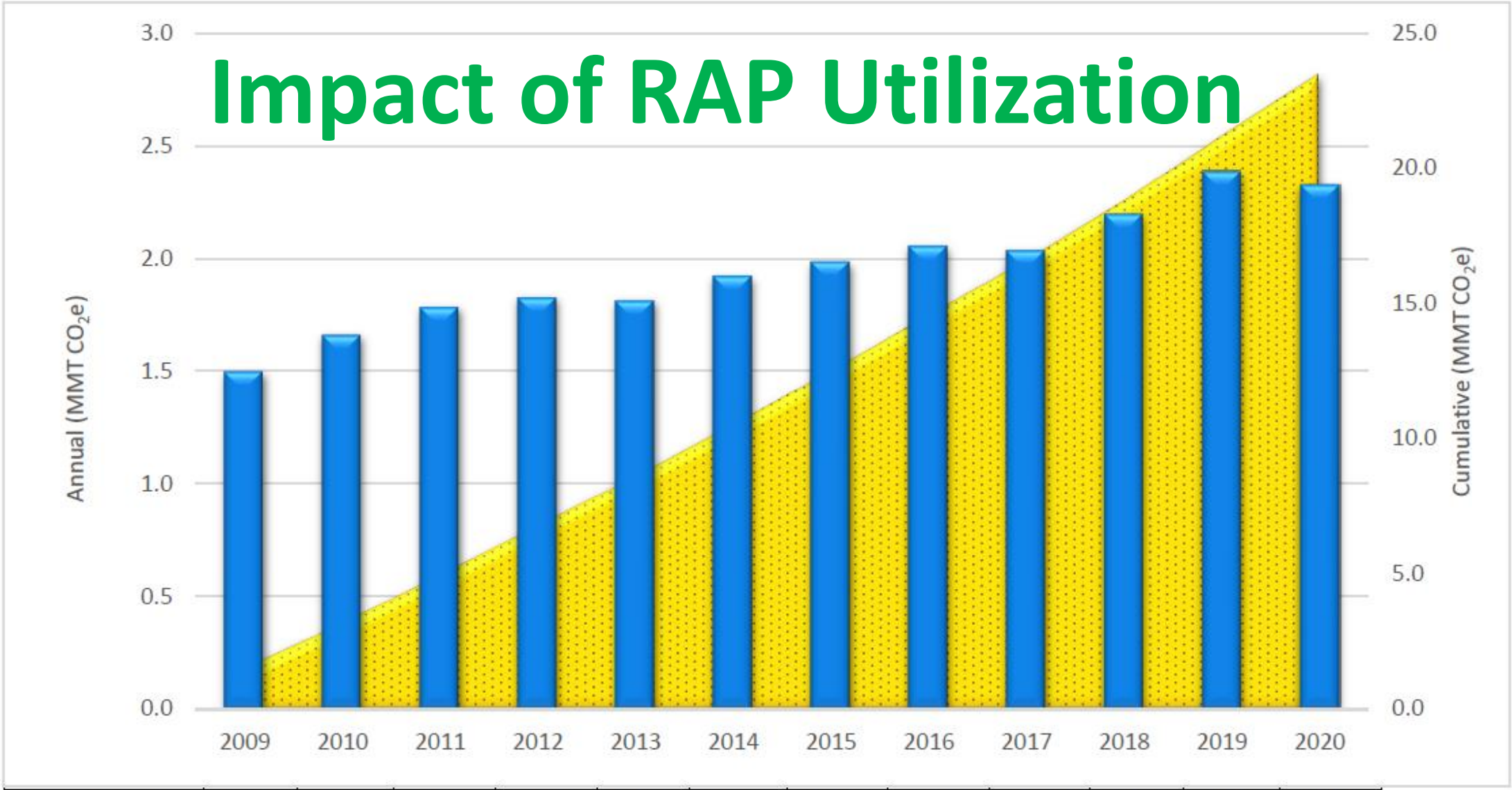


$3 billion economic savings in 2020

https://www.asphaltpavement.org/expertise/sustainability/sustainability-resources/recycling

Impact of RAP Utilization



GHG Emissions	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Cumulative	1.5	3.2	4.9	6.8	8.6	10.5	12.5	14.5	16.6	18.8	21.2	23.5
Annual	1.5	1.7	1.8	1.8	1.8	1.9	2.0	2.1	2.0	2.2	2.4	2.3

Figure 19: GHG Emissions Reduction from Use of RAP in New Asphalt Mixtures, 2009–2020

Warm Mix Asphalt

- 45% of mix is produced with WMA technologies
  - 186 million tons
- Half is at reduced temp. (at least 10°F)
  - 93 million tons

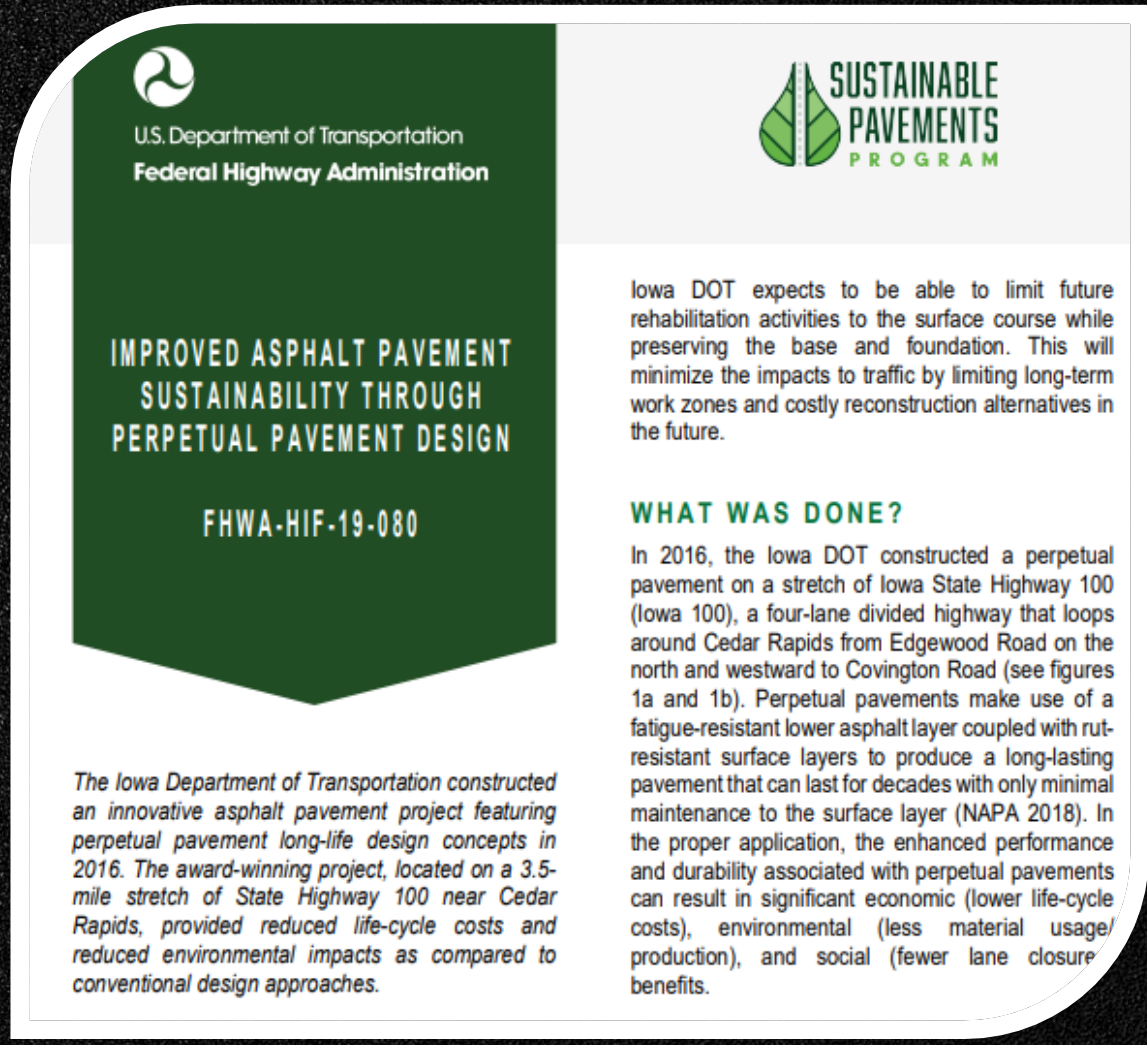
is max temp. specification the future?

404-3 CONSTRUCTION DETAILS. Requirements of §401-3 and §402-3 shall apply except as noted herein.

Mix Temperature. The desired WMA mixture temperature shall be within the mixing and compaction range as recommended by the WMA technology provider not to exceed 295°F at the point of discharge of the haul vehicle, unless a higher temperature is approved by the Regional Materials Engineer.

Perpetual Pavements

- Iowa Case Study
- 17-28% reduced economic cost
- 20% reduced GHG emissions
- Resistant to moisture damage – Resilience!



U.S. Department of Transportation
Federal Highway Administration

SUSTAINABLE PAVEMENTS PROGRAM

IMPROVED ASPHALT PAVEMENT SUSTAINABILITY THROUGH PERPETUAL PAVEMENT DESIGN

FHWA-HIF-19-080

The Iowa Department of Transportation constructed an innovative asphalt pavement project featuring perpetual pavement long-life design concepts in 2016. The award-winning project, located on a 3.5-mile stretch of State Highway 100 near Cedar Rapids, provided reduced life-cycle costs and reduced environmental impacts as compared to conventional design approaches.

Iowa DOT expects to be able to limit future rehabilitation activities to the surface course while preserving the base and foundation. This will minimize the impacts to traffic by limiting long-term work zones and costly reconstruction alternatives in the future.

WHAT WAS DONE?

In 2016, the Iowa DOT constructed a perpetual pavement on a stretch of Iowa State Highway 100 (Iowa 100), a four-lane divided highway that loops around Cedar Rapids from Edgewood Road on the north and westward to Covington Road (see figures 1a and 1b). Perpetual pavements make use of a fatigue-resistant lower asphalt layer coupled with rut-resistant surface layers to produce a long-lasting pavement that can last for decades with only minimal maintenance to the surface layer (NAPA 2018). In the proper application, the enhanced performance and durability associated with perpetual pavements can result in significant economic (lower life-cycle costs), environmental (less material usage/ production), and social (fewer lane closure benefits.

https://www.fhwa.dot.gov/pavement/sustainability/case_studies/hif19080.pdf

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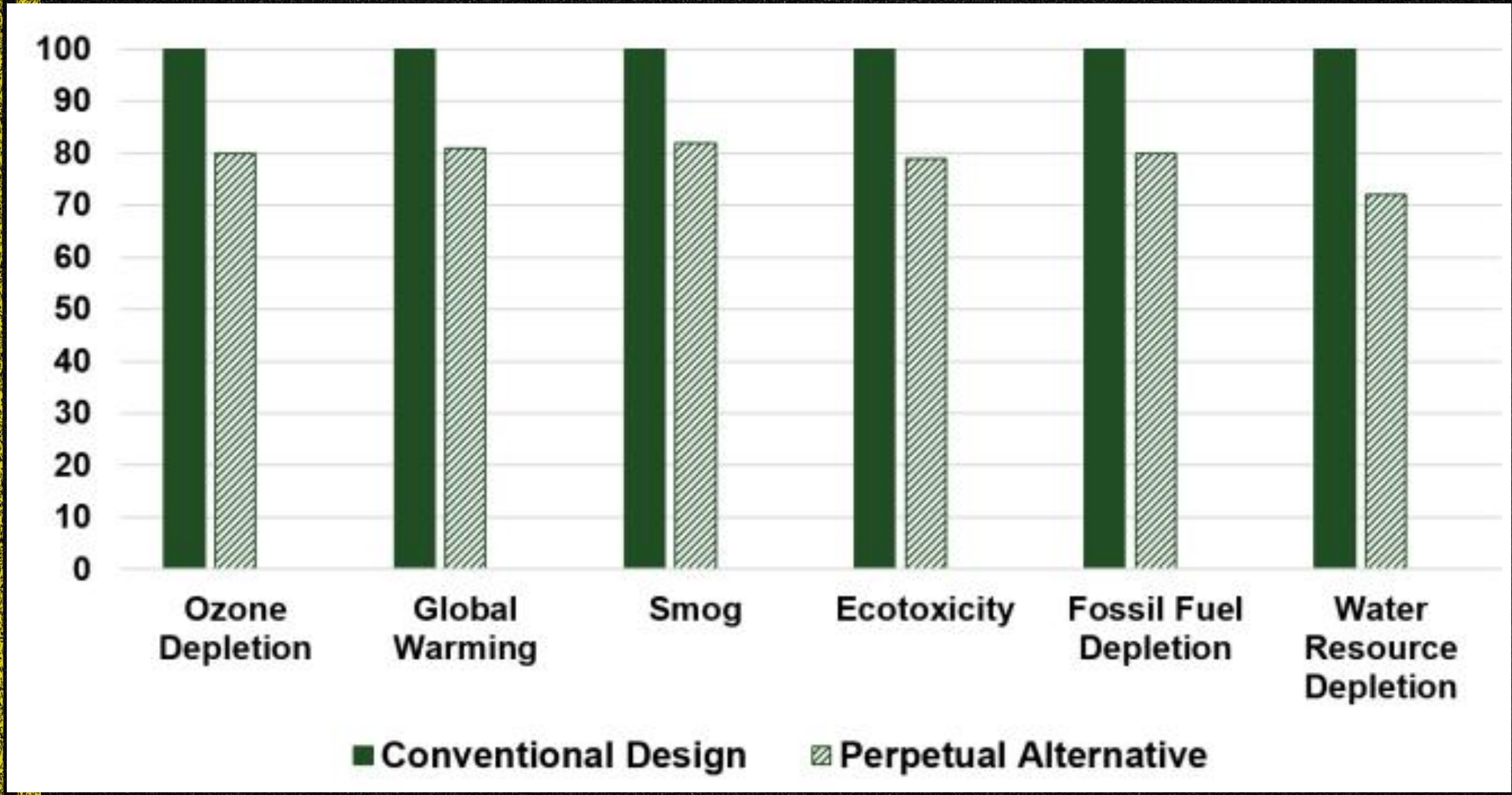
Perpetual Pavements – Iowa Case Study



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Resilience and Asphalt Pavements

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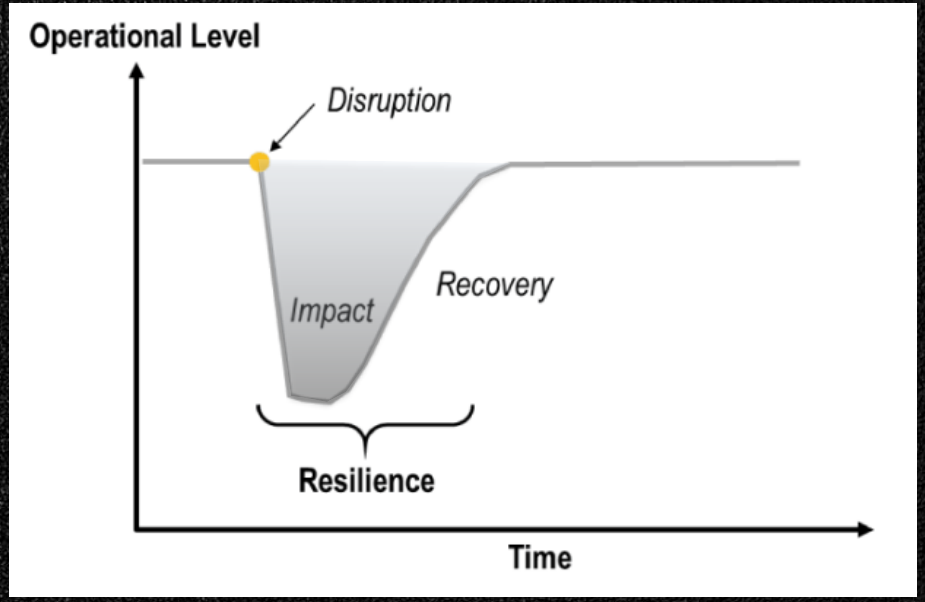
What is Resilience?

The ability to anticipate, prepare for, and **adapt** to changing conditions and **withstand**, respond to, and **recover** rapidly from disruptions

- FHWA Directive 5520



https://transportgeography.org/?page_id=10994

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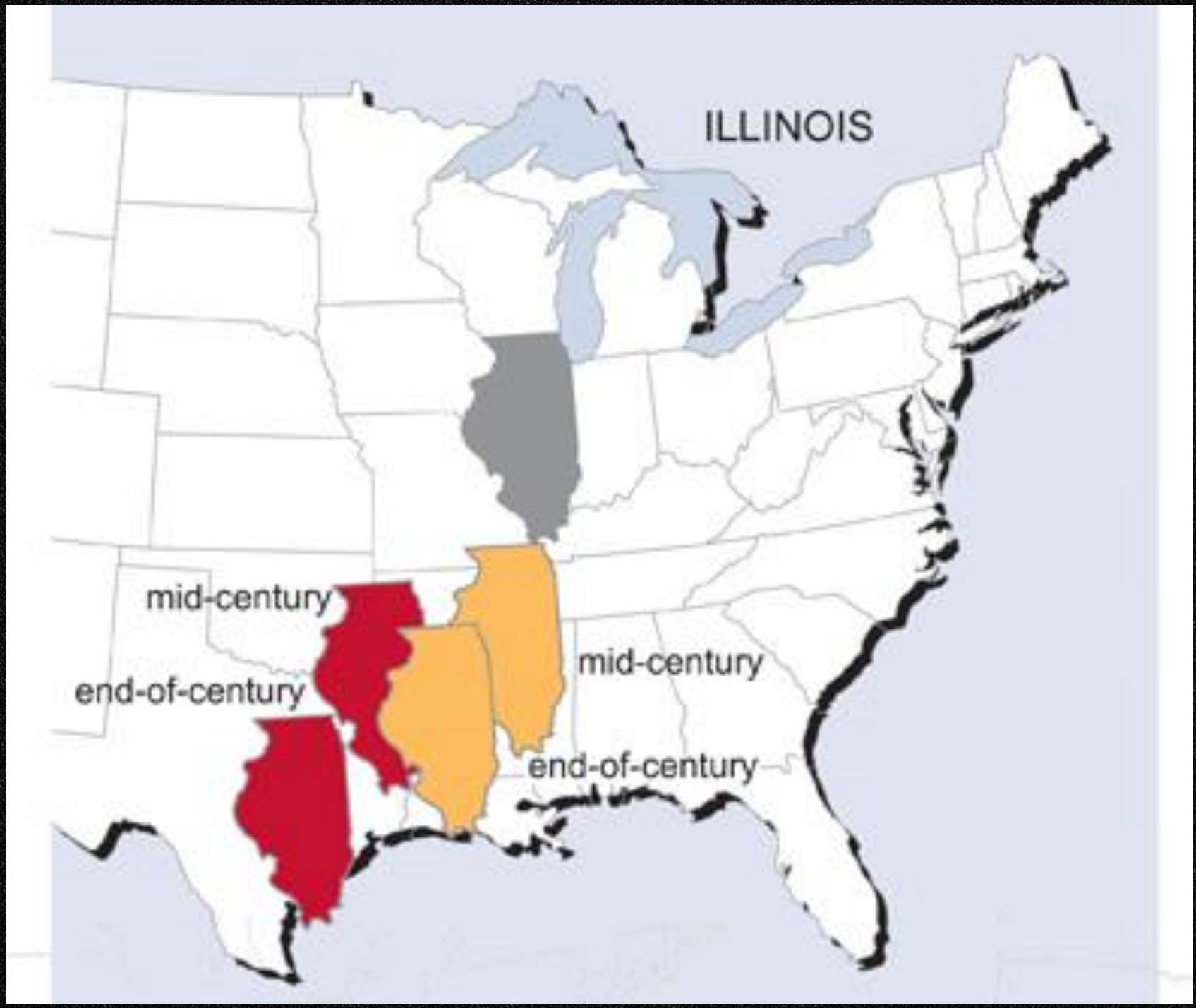

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Adaptation Tools for Asphalt Pavements

- Use of climate models in pavement design and material selection
- Leverage maintenance overlays with climate adaptable materials
- Porous asphalt to reduce runoff during rain events
- Complement hardening or adaptation with nature-based solutions

https://climatechange.chicago.gov/climate-impacts/climate-impacts-midwest

https://sustainablebuildingsinitiative.org/toolkits/climate-resilience-toolkits/stormwater-mgmt/paving-and-asphalt?toolkit=230

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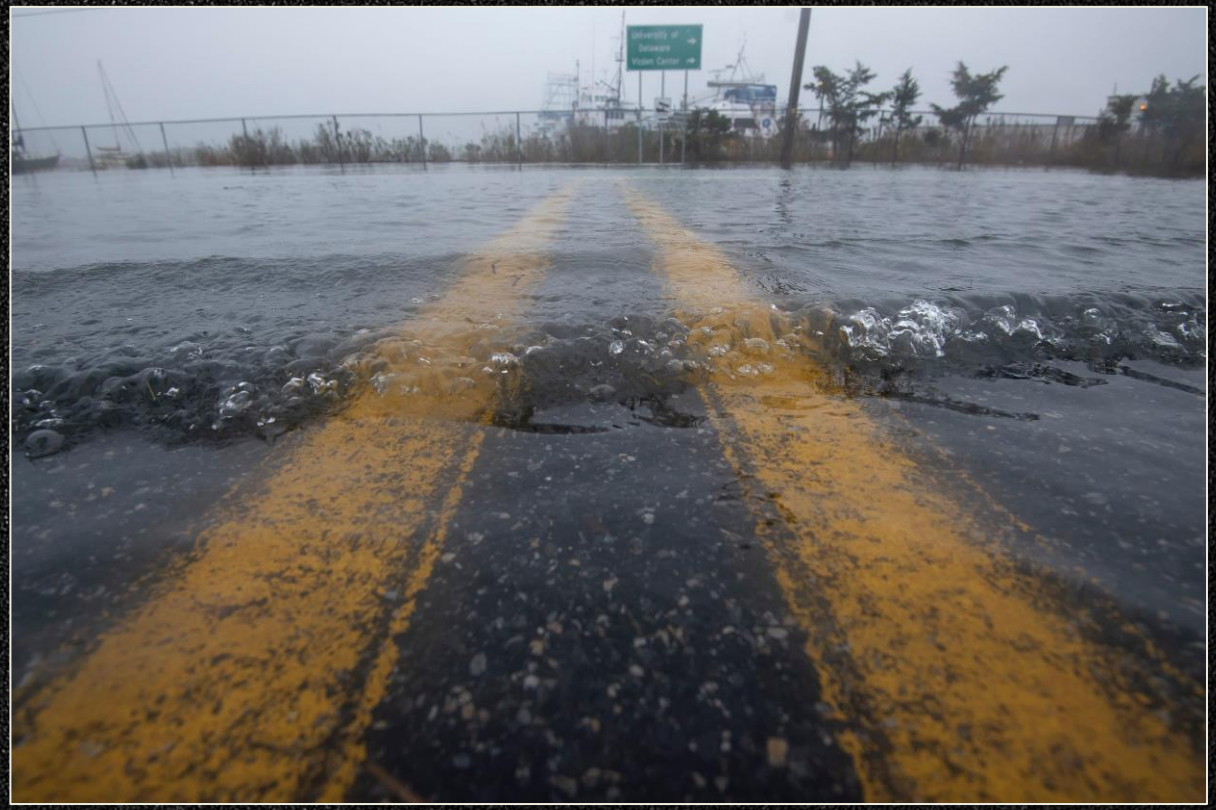
Withstand
Tools for Hardening Asphalt Pavements

- Perpetual Pavement design for stronger pavements
- Deep reconstruction to stabilize base and subgrade



https://www.delawareonline.com/story/news/2019/08/27/roads-flooding-delaware-fix/2129785001/

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Tools for Asphalt as a First Responder

- Rapid construction to repair damaged roads and reduce user delay costs
- Warm mix asphalt to improve pavement quality during cold weather paving and long transport distances
- Recycled materials when supply chains are disrupted
- Contingency planning for asphalt plant and construction operations

https://www.infrastructure-exchange.com/single-post/roads-vs-extreme-weather-designing-more-resilient-roads

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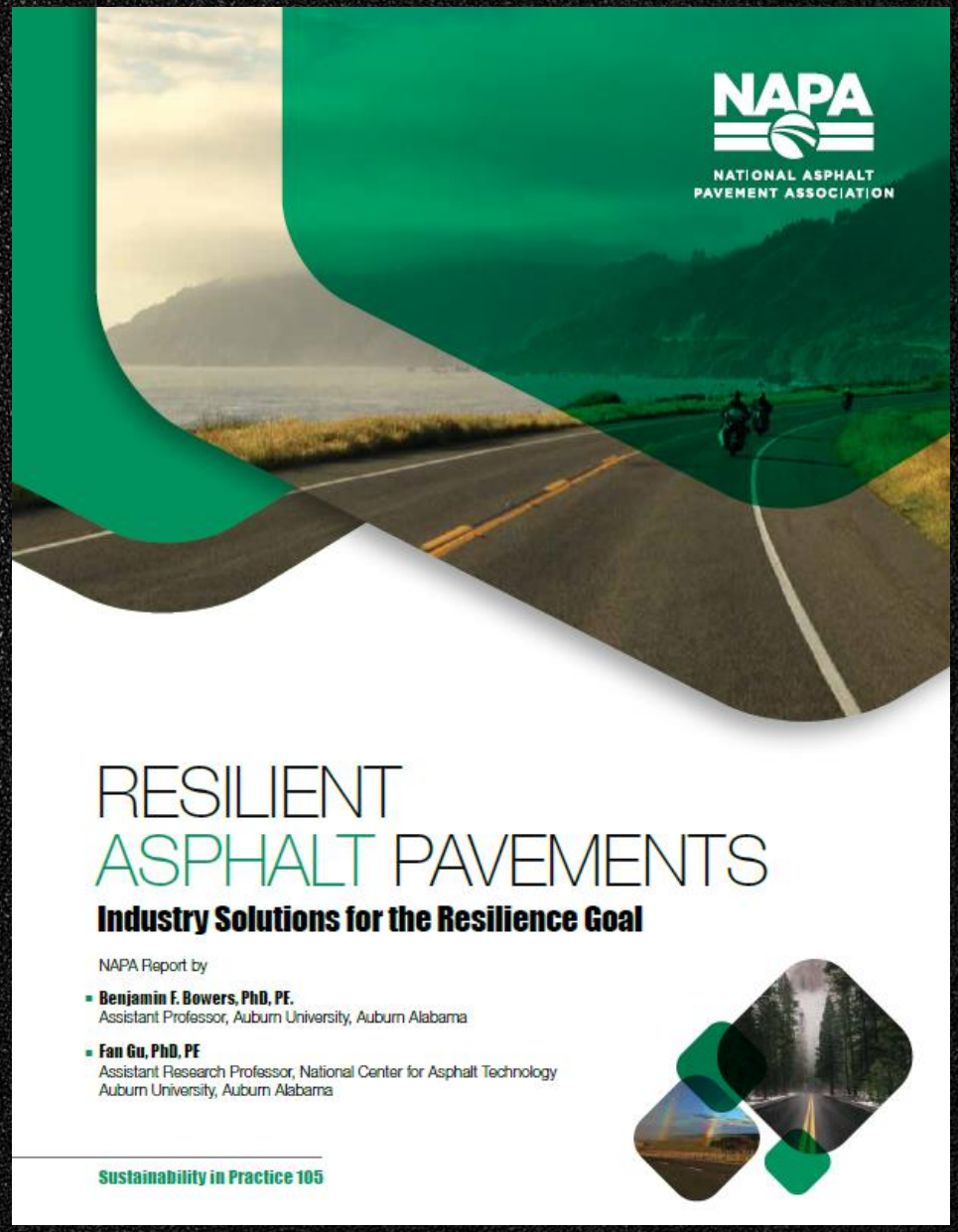
Case Study – Iowa Floods of 2019

- Two major floods
- **$10.2 million** in contract incentives for speed of construction
- Perpetual design improves future resilience
- Innovative uses of asphalt



https://member.asphaltpavement.org/Shop/Product-Catalog/Product-Details?productid={6399F00E-2392-EB11-B1AC-000D3A9A6645}

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Thank you, Illinois!

Gold Club (50+ Years)

- E.D. Etnyre & Co.
- Gallagher Asphalt Corp.
- Geneva Construction Co.
- Howell Asphalt Co.
- Kankakee Valley Construction
- Open Road Paving Co.

30-Plus Club

- Advanced Asphalt Co.
- BLS Enterprises
- Charles E. Mahoney
- Diamond Construction Co.
- E.T. Simonds Materials Co.
- Iroquois Paving Corp.
- Truman L. Flatt & Sons Co. Inc.
- William Charles Construction Co., LLC

State Advisor: Dan Gallagher, Gallagher Asphalt Corp.

Thank you, Illinois!

Illinois Members

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- Roads & Bridges Magazine
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