# The Role of Asphalt Pavements In a Low-Carbon Transportation Network

NATIONAL ASPHALT PAVEMENT ASSOCIATION

The asphalt pavement industry has a long history of implementing sustainable practices and is actively engaged in multiple efforts to reduce the carbon footprint of pavements. With over 90% of America's roads paved with asphalt[1] and transportation vehicles as the largest source of carbon emissions in the U.S.,[2] building and maintaining smooth asphalt pavements plays a significant role in creating a low-carbon transportation network.

When it comes to asphalt pavements, emission reductions can be achieved through expanded use of existing proven technologies and optimized design and construction practices, such as:

- **Enhanced Performance** — New asphalt pavements are smoother than ever while maintaining vehicle safety, and smoother pavements improve vehicle fuel efficiency while also reducing vehicle wear and tear, offering numerous benefits across the nation's entire fleet of vehicles.
- **100% Recyclable Asphalt** — Old roads and parking lots are completely recyclable. During maintenance and resurfacing activities, reclaimed asphalt pavement is effectively mined from the road for use in new pavements, reducing the emissions associated with extracting and producing raw materials.
- **Reduced Mix Production Energy** — Warm-mix asphalt technologies can reduce mix production temperature, reducing production energy requirements and associated emissions.
- **Long-Life Pavement Design** — Perpetual Pavement designs yield asphalt pavements with an indefinite structural life so that only the surface needs periodic replacement, eliminating emissions and user delay associated with reconstructing pavements from the bottom up.
- **Optimized Construction Practices** — Asphalt pavements are placed quickly, have no cure time, and are often placed at night, all of which reduces traffic congestion and associated emissions.

### Enhanced Performance

The thing drivers want most from roads is a smooth ride,[3] and for good reason. Smoother roads are safer, quieter, and cause less wear and tear on vehicles. Multiple studies have also found that smoother roads can reduce fuel consumption by 2.5 to 4.5%, which significantly reduces carbon emissions.[4,5] Texture and pavement stiffness may also affect fuel economy, but there is no consensus on the magnitude of their impact, and research shows that smoothness has the most significant pavement property impacting vehicle fuel economy.[6] Because of the flexible nature of asphalt pavements and the construction practices used, asphalt pavements tend to be built smooth and are easy to maintain at a high level of smoothness.

If smoother pavements can yield just a 2% improvement in fuel economy across the country's roads through increased funding of road maintenance, vehicle-related carbon emissions[2] would drop by nearly 30 million metric tons per year, the equivalent of taking over 6 million cars[7] off the road.

### 100% Recyclable Asphalt

The asphalt industry is a leader in the use of recycled materials. Presently, more than 75 million tons of reclaimed asphalt pavement (RAP) are mined from existing roads as part of maintenance and resurfacing activities and re-used in new pavements each year, making asphalt pavement the most recycled material in America. Today, new highway pavements include about 20% RAP, which is up from 12% in 2009.

RAP replaces new aggregates and asphalt binder, which avoids the emissions from producing those materials while saving over $2 billion per year.[8] The adhesive properties of old asphalt binder in RAP can be restored for use in new pavements, creating a truly circular economy. Even though asphalt binder is a

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petroleum product, the inherent carbon is never burned and is effectively sequestered. In fact, the U.S. EPA recognizes asphalt pavements as one of the most efficient carbon sinks because it keeps carbon locked away.[2]

The asphalt pavement industry has made considerable investments in research and product development to ensure that pavements with RAP and other reclaimed, recycled, and waste materials perform at least as well as pavements without these materials. By ensuring equivalent or better performance, the public gets the benefits of recycling without sacrificing pavement life or performance.

**Reduced Production Energy**
The asphalt industry has rapidly adopted and refined warm-mix asphalt (WMA) technologies. WMA technologies enable asphalt pavement plants to reduce production temperatures by 10°F or more compared to traditional hot-mix asphalt, reducing both mix production energy requirements and carbon emissions. In 2017, nearly 40% of asphalt pavement produced in the U.S. used WMA technologies, up from about 5% in 2009.[8] The industry is committed to further increasing the use of WMA and improving its effectiveness. Other industry efforts to reduce production energy demands include actively managing aggregate stockpiles to reduce moisture content and optimizing production equipment performance, both of which result in more energy-efficient production.

**Long-Life Pavement Design**
Long-life asphalt pavements use a Perpetual Pavement design methodology to ensure enough strength and durability to eliminate the potential for structural failure, thereby eliminating the future need for full-depth reconstruction. Although the surface wearing course requires periodic maintenance, those repairs are relatively easy and cost-effective to make. With a pavement structure that lasts beyond 50 years, overall maintenance activities are greatly reduced,[9] as are maintenance-related emissions.

**Optimized Construction Practices**
The excess fuel burned by vehicles idling in traffic during construction can be a significant source of carbon emissions, particularly in congested urban and metropolitan areas. A major benefit of asphalt pavements is that they are fast to place, have no cure time, and are often placed outside of rush hour when traffic volumes are low. Because of this, asphalt pavements help minimize construction-related traffic congestion[10] and emissions.

**What Can Congress Do**
There are several areas where Congress can act to further reduce the carbon footprint of pavements:

- Provide adequate funding through the next transportation reauthorization bill to keep existing roads smooth through maintenance, rehabilitation, and reconstruction;
- Encourage the Federal Highway Administration (FHWA) to work with state highway agencies to increase RAP and WMA adoption with the goal of further reducing emissions;
- Provide funding for research and deployment of technologies that further reduce the need for virgin asphalt binder, such as high RAP mixes; and
- Encourage FHWA to evaluate Perpetual Pavement design for use as an approved design methodology for state highway agencies.

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