Global Cool Cities ALLIANCE

# Cool Roadways Partnership

1500 Decatur St NW Washington DC 20011 • Email: Kurt@globalcoolcities.org • Phone: 202-550-5852

## Cool Roadway Solutions: Request for Information
## December 8, 2020

*The Cool Roadways Partnership (CRP) represents 20 participants who recognize the need to build heat-resilient communities and are seeking cool roadway solutions to help meet that goal. Together, CRP participants anticipate investing $4.75 billion to add, maintain, or replace 70,000 lane-miles over the next 10 years. Through this Request for Information (RFI), the CRP is seeking industry partners to work collaboratively with its participants to identify, develop, demonstrate, and deploy cool roadway solutions that can be incorporated into their paving operations. The RFI submissions will be used to inform the CRP's near-term program activities and long-range planning.*

**Project Overview**

Currently, replacing green space with paved surfaces and roadways is seen as a primary driver of increased heat in cities. This RFI is seeking input from manufacturers and distributors of roadway materials willing to invest the time and resources needed to identify or develop products that transform roadways from a barrier to a key solution for improving the heat resilience of our cities. This RFI supports the CRP's plans to:

1. ***Identify*** existing or develop new and innovative cool roadway solutions, that also may offer co-benefits of reduced lifecycle greenhouse gas (GHG) emissions;
2. ***Create*** opportunities to demonstrate cool roadway solutions in more places;
3. ***Quantify*** the market potential for cool roadway materials, leading to a multi-year bulk procurement arrangement with jurisdictions across the U.S.; and,
4. ***Establish*** a clear set of industry-approved design characteristics and performance criteria for cool roadways.

**The Demand for Cool Roadways**

Pavement makes up about one third of the surface area of an average city. Faced with long-term projections of rising urban temperatures and an increased frequency of dangerous heat waves, jurisdictions are seeking ways to reduce pavement temperatures to help achieve their sustainability and resilience goals. Cool pavement products and materials reflect, rather than absorb, solar energy which lowers surface temperatures and contributes to reduced air temperatures. A cost-effective, high-performing cool roadway solution is needed that can be smoothly integrated into municipal pavement management operations.

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CRP participants are pursuing a variety of ways to reduce the heat retention of roadways, as part of their efforts to manage urban heat. Reducing air temperatures with cool roadways also provides desirable health and air quality co-benefits, which is particularly important in marginalized, low income communities where the negative effects of heat are most apparent.

CRP participants are in various stages of exploring cool roadways. Some participants are still in the early phases of learning about their use and local benefits, others are already implementing demonstration projects, and a few are currently evaluating cool roadways for inclusion in their pavement management and maintenance operations.

**RFI Market Size**

The opportunity for cool roadway solutions is substantial. Together, the 20 CRP participants have annual road repair and replacement budgets of $475 million to address 7,000 lane-miles of streets. Based on current budgets, the participants will have the potential demand for 70,000 lane-miles and a financial investment of $4.75 billion in cool roadways over the next ten years.

**Responding to the RFI**

The RFI respondents are invited to provide the requested information and feedback on the attached Response Form. Responses should include input on the timeline to develop an innovative solution that meets the requested criteria and that can be integrated into roadway pavement operations within ten years.

Questions regarding this RFI shall be addressed to Maria Koetter (maria@globalcoolcities.org) no later than February 5, 2021. Responses to questions will be provided by February 19, 2021. Final responses will be collected through March 19, 2021.

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**Cool Roadways Partnership Participants (as of December 8, 2020)**


Austin, TX
Berkeley, CA
Cary, NC
Cincinnati, OH
Columbia, MO
Davis, CA
Elk Grove, CA
El Paso, TX
Jackson, MS
Las Cruces, NM
Los Angeles, CA
Louisville, KY
Phoenix, AZ
Philadelphia, PA
Sacramento, CA
San Antonio, TX
San Antonio River Authority
San Antonio 2030 District
Tempe, AZ
Tucson, AZ

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## Cool Roadway Solutions - Request for Information Response Form
## December 8, 2020

Please provide the requested information and feedback below. Responses should include input on the timeline to develop an innovative solution that meets the requested criteria and that can be integrated into roadway pavement operations within ten years. Please add your responses below each question and send the completed form in a Word file to Maria Koetter – maria@globalcoolcities.org.

| | |
|---|---|
| **Contact Name:** | Dr Peter Taylor |
| **Company:** | National Concrete Pavement Technology Center |
| **Email:** | ptaylor@iastate.edu |
| **Phone:** | 515 294 9333 |
| **Solution/Product Name:** | Concrete Overlays |

**Describe how the proposed solution addresses the following** (250 word maximum for each response):

1. What is the expected timeline to develop and commercialize the solution if it is not currently available?

   Concrete overlays have been constructed on top of old, dark, worn, pavements of all types for over 40 years. However, their adoption has been limited to a relatively small number of applications in some states. Implementation can move forward immediately.

   This approach serves to improve / restore pavement structural performance at the same time as increasing albedo, with a minimum of negative environmental impacts.

2. What surface and air temperature reductions resulting from the roadway solution, daytime and nighttime, have you identified?

   By increasing the albedo of a pavement surface by up to four times, the amount of heat absorbed by the pavement can be similarly reduced. (https://intrans.iastate.edu/app/uploads/2019/12/quantifying_pvmt_albedo_w_cvr.pdf)

   Mixtures containing slag cement or white cement can further increase the albedo. This technique is used by groups seeking to gain LEED points in parking lots.

One challenge is that data has shown that dirt collecting on concrete overlays can reduce the albedo, it still remains higher than that of darker systems.

3. How simply can the solution be integrated into existing roadway management and maintenance operations?

   This approach has been successfully adopted by many agencies such as Iowa DOT as a regular part of their roadway management operations.

4. What is the global warming potential associated with manufacturing the roadway solution in production and use phase?

   Research has shown that stiffer, smoother pavements reduce the fuel consumption of the vehicles travelling on them. Especially tuck traffic. Adopting concrete overlays will significantly reduce the carbon footprint of the vehicles that travel those routes (http://cshub.mit.edu/pavements/pvi).

5. Add any additional information for the proposed solution. Attach photos, videos or links to materials demonstrating application, installed condition, and relevant characteristics of the solution such as product material safety data sheets

   An abundance of material is available at cptechcenter.org/overlays. A database of existing overlays can be found at http://overlays.acpa.org/webapps/overlayexplorer/index.html

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**Cost and Installation** (50 word maximum for each response):

1. Can the solution be purchased and installed by in-house department staff (i.e. does not require a licensed installer): No

   Any contractor able to place concrete pavements will able to do this work
   - If so, does it require special equipment to install it: No
   - If so, what is the cost per square yard for materials: $/SY

   See below

2. What is the cost per square yard for material if installed by contractor: $/SY

   Concrete overlay materials costs will vary by region and market – but are comparable with conventional concrete mixture costs ~$70 to $100 / cubic yard

3. What is the average installation rate: SY/Day?

   Constructed costs of concrete overlays have been reported to range in price from $3.29 /sy/inch to $6.14 /sy/inch

**Use Cases** (250 word maximum for each response)

1. What are the appropriate use cases for the solution (e.g., pavement type, age, condition, climate)? Please provide appropriate case studies, testing, and/or supporting research.

   Concrete overlays can be applied to most existing pavements, normally as part of regular maintenance to extend pavement life, restore ride quality or increase load carrying capacity. Many examples are reported at http://overlays.acpa.org/webapps/overlayexplorer/index.html

   One challenge in urban environments is that increasing the elevation of a pavement ~4 inches may take some careful detailing to ensure ongoing compatibility with crossings, driveways, service manholes and overhead bridge clearances.

2. What are the safety, slipperiness, and friction characteristics (e.g. typical Surface Coefficient of Friction)?

   Coefficient of friction is the same as any concrete surface, controlled by the type of fine aggregate in the mixture and the finishing work conducted on it. Loss of friction is uncommon over time

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3. What is the curing time including how quickly the road can open to traffic after installation given average temperatures, partly sunny, and non-humid conditions? How does this compare to existing relevant products?

   Typically, traffic can be returned to the pavement within 3 to 7 days.

4. Is it sensitive to placement in cool weather, i.e. 50º F and falling? Yes/No

   Paving is discouraged at 40°F and falling

5. Is it sensitive to placement in high humidity or damp conditions? Yes/No

   No – in fact high humidity will increase concrete hydration leading to improved characteristics.

6. How long does this treatment typically last under average traffic conditions in years? How does this compare to similar products?

   Data from Iowa shows that typical lifetime is 25 to 40 years (https://intrans.iastate.edu/app/uploads/2017/09/Iowa_concrete_overlay_performance_w_cvr.pdf)

7. Can it be re-applied over itself for renewal? Yes/No

   Yes

8. Is it recommended for heavy traffic conditions like urban arterials? Yes/No

   Yes

9. Are standard MUTCD compliant white and yellow markings clearly visible? Yes/No

   Yes