

# The Cool Surfaces Manhattan Project: Accelerating deployment of cool roofs and walls across the United States

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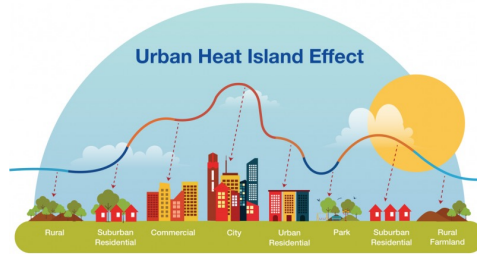
Cool Roof Rating Council Annual General Membership Meeting  
Las Vegas • 15 June 2022



# Cool roofs and walls can provide many well-known benefits to building occupants, communities, power utilities, and the planet



HVAC energy and \$ savings



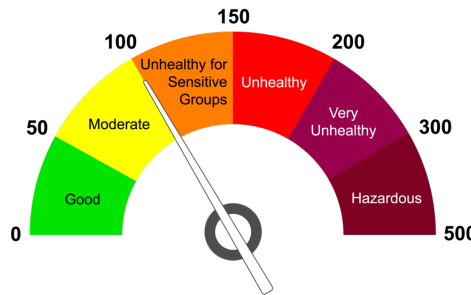
Heat island mitigation



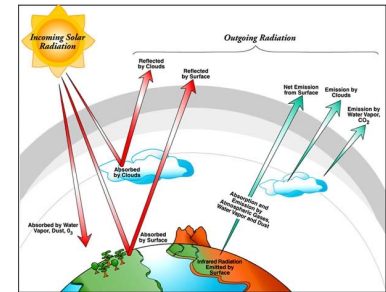
Peak power demand reduction



Comfort, health, and safety in heat waves



Smog abatement

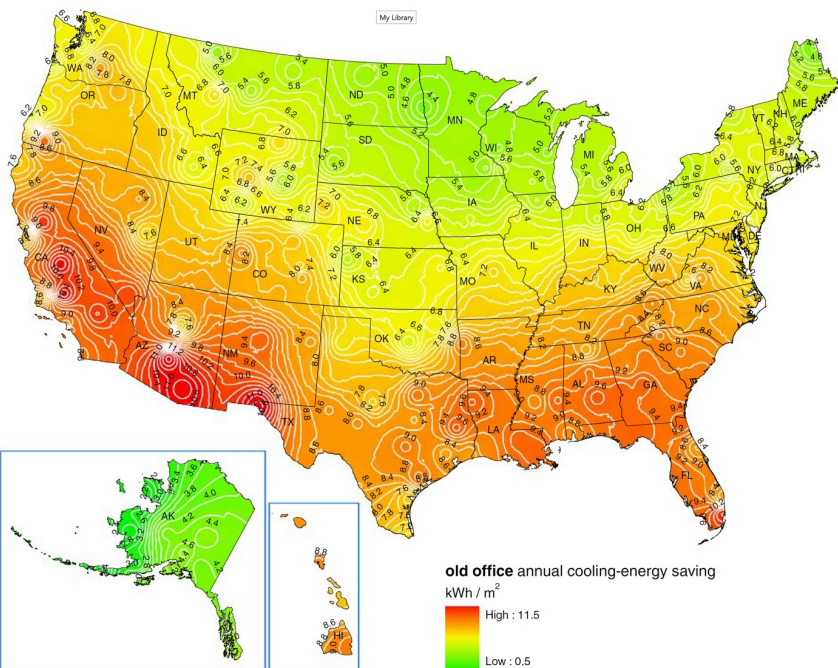


Global cooling

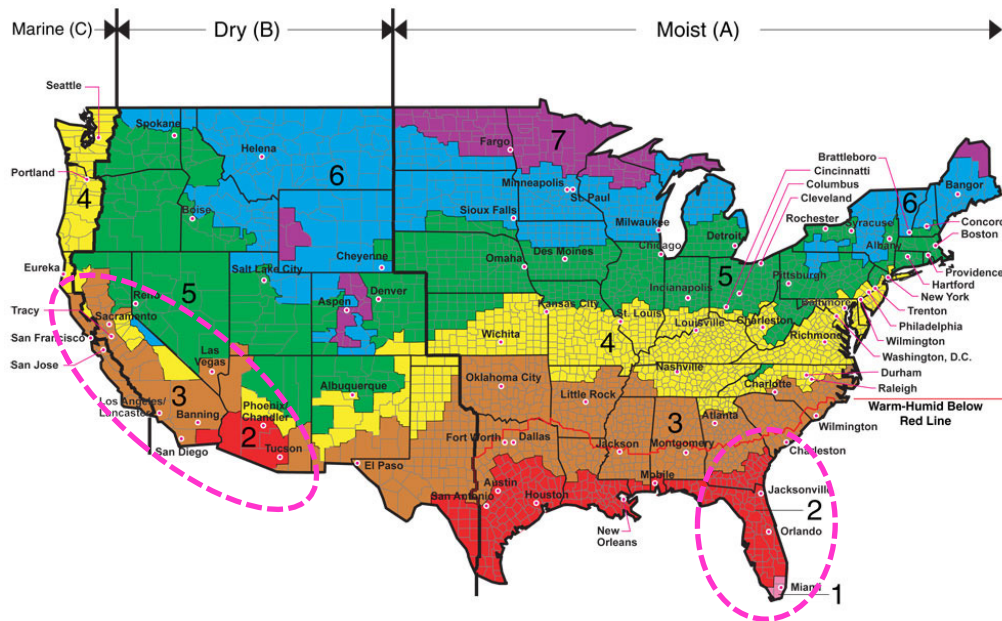


Cool surfaces can help across the southern half of the U.S.  
 (ASHRAE climate zones 1 - 4, and beyond (climate zone 5))

(a) Cool-roof cooling energy savings



(b) ASHRAE climate zones



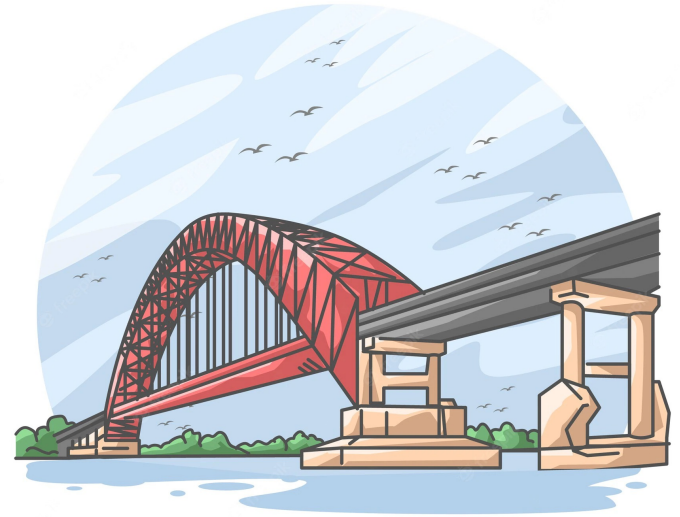
...but are found mostly in CA, AZ, and FL



The **Cool Surfaces Manhattan Project** seeks to bridge this gap by making our aging building infrastructure cooler and more heat resilient

## Goal:

Dramatically increase the climate-appropriate deployment of cool surfaces across the U.S., with an emphasis on their application to disadvantaged communities.



A broad team of cool-surface experts is tackling this challenge with support from DOE's Building Technologies Office



BUILDING TECHNOLOGIES OFFICE



The research phase of our project (Jan - Sep 2022) will develop a two-year deployment plan (Oct 2022 - Sep 2024)

## Phase 1: Research & planning



- ❶ Identify opportunities and barriers
- ❷ Adapt successful deployment models
- ❸ Engage with stakeholders
- ❹ Produce the Phase 2 deployment plan

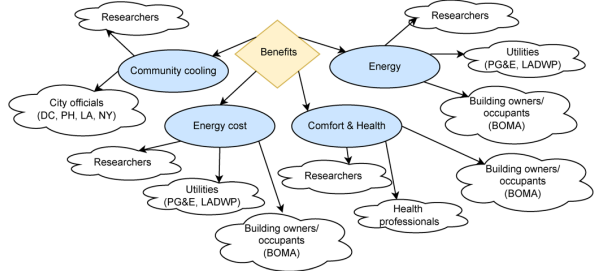
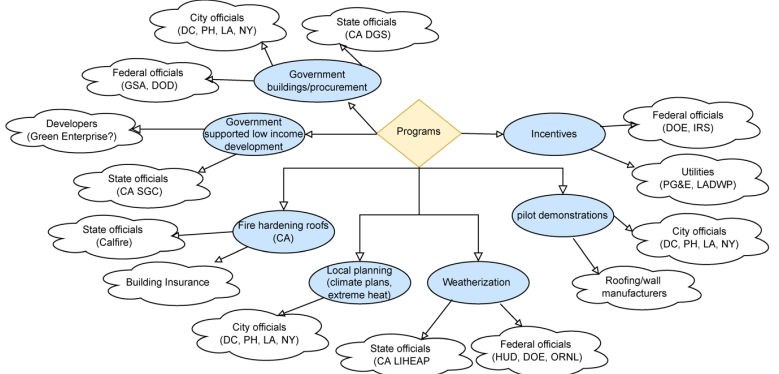
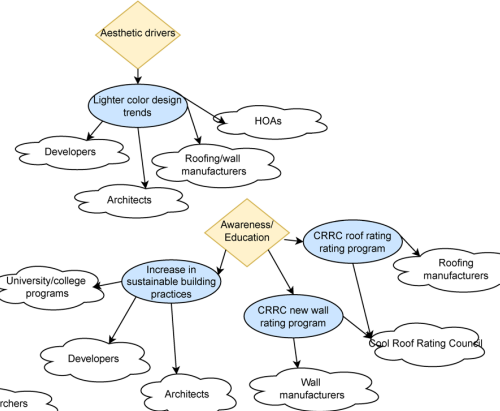
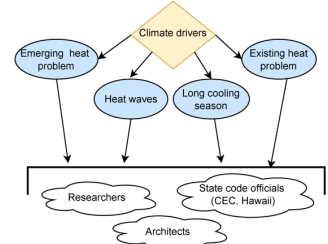
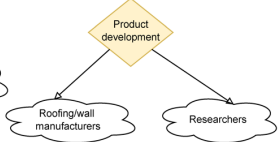
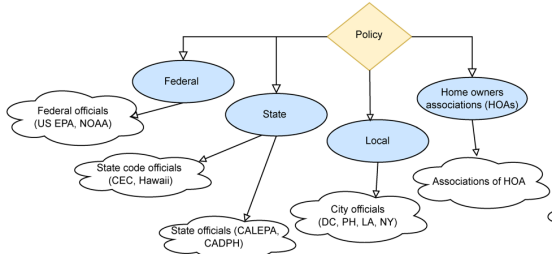
# We diagrammed **opportunities** for cool-surface deployment via policy, programs, education, and other channels...

**LEGEND**

- Opportunity category
- Opportunity subcategory
- Stakeholder group who can speak to opportunity subcategory




The categories and subcategories are identified to help guide the development of questions for the different stakeholders.

## Opportunities for cool surfaces

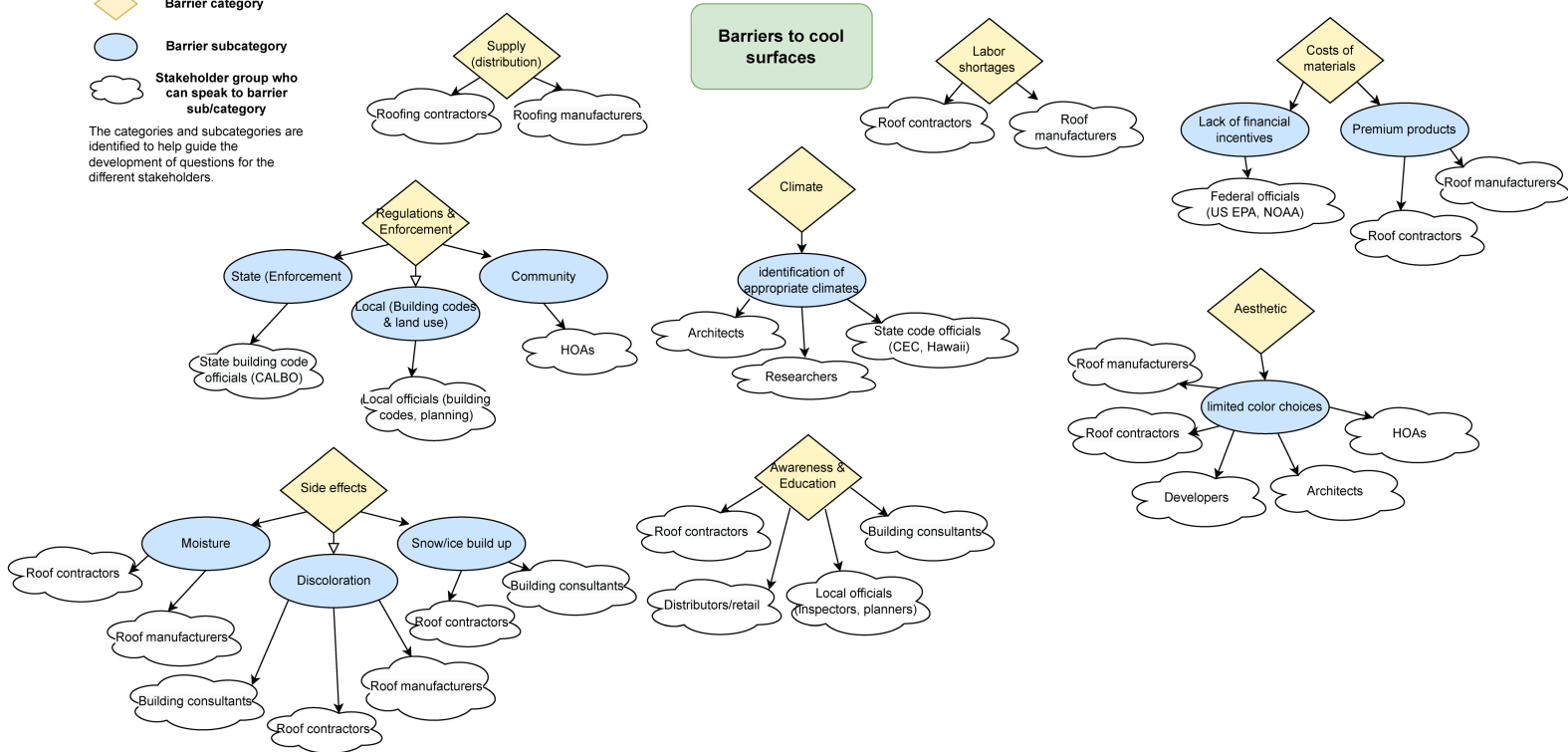


# ...as well as **barriers** related to supply, cost, aesthetics, regulation/enforcement, climate, and side effects

## LEGEND

-  Barrier category
-  Barrier subcategory
-  Stakeholder group who can speak to barrier subcategory

The categories and subcategories are identified to help guide the development of questions for the different stakeholders.



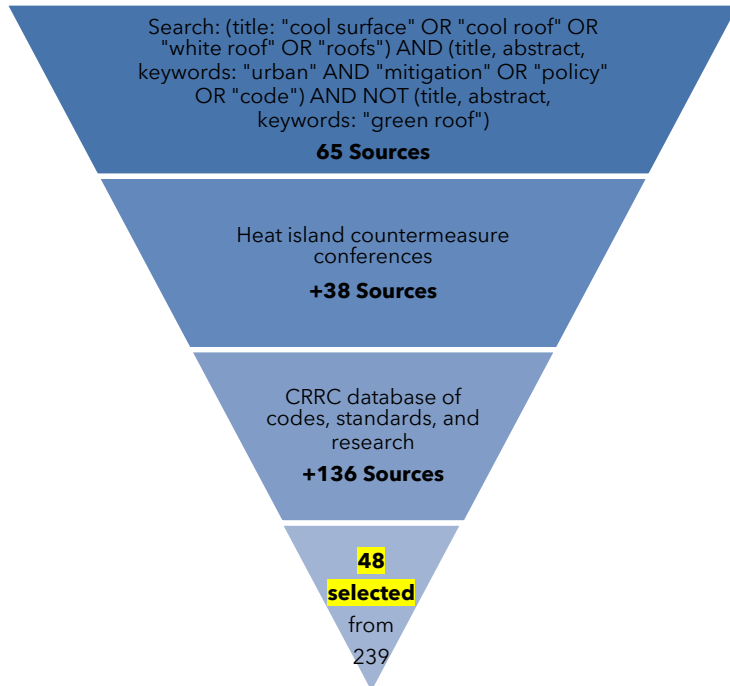


We conducted a **literature review** and **stakeholder interviews** to learn from others

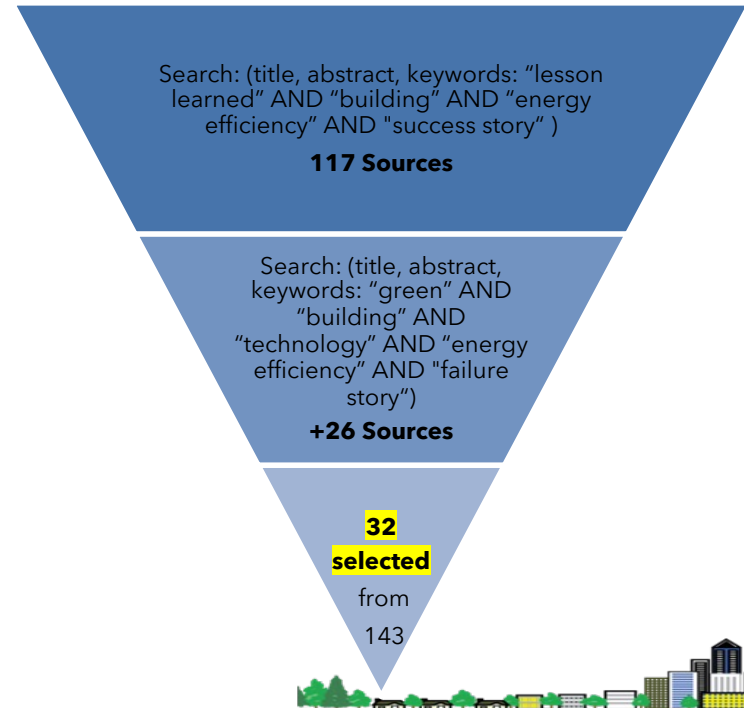


# The literature review examines the history of cool-surface deployment activities and energy-efficiency/green building programs with successful track records

## 1. Cool-surface deployment activities (e.g., code improvements, incentives, certification, labeling)



## 2. Successful energy-efficiency/green building programs



# We prepared for online interviews by developing questions tailored to each stakeholder group

## **Example: High-level questions asked of city and federal employees**

1. What is your role at {agency}?
2. How long have you been in that role and with {agency}?
3. Have you considered or implemented energy efficiency or cool surface (wall, roof, or pavement) codes, ordinances, or voluntary programs?
4. Have you implemented any projects or demonstrations that could serve as a model, or offer lessons learned related to cool surfaces?
5. Are there any challenges or impediments to requiring or promoting cool surfaces in {city/county/state}?
6. Are you aware of any other reasons to not require the installation of cool surfaces? If yes, what are they?

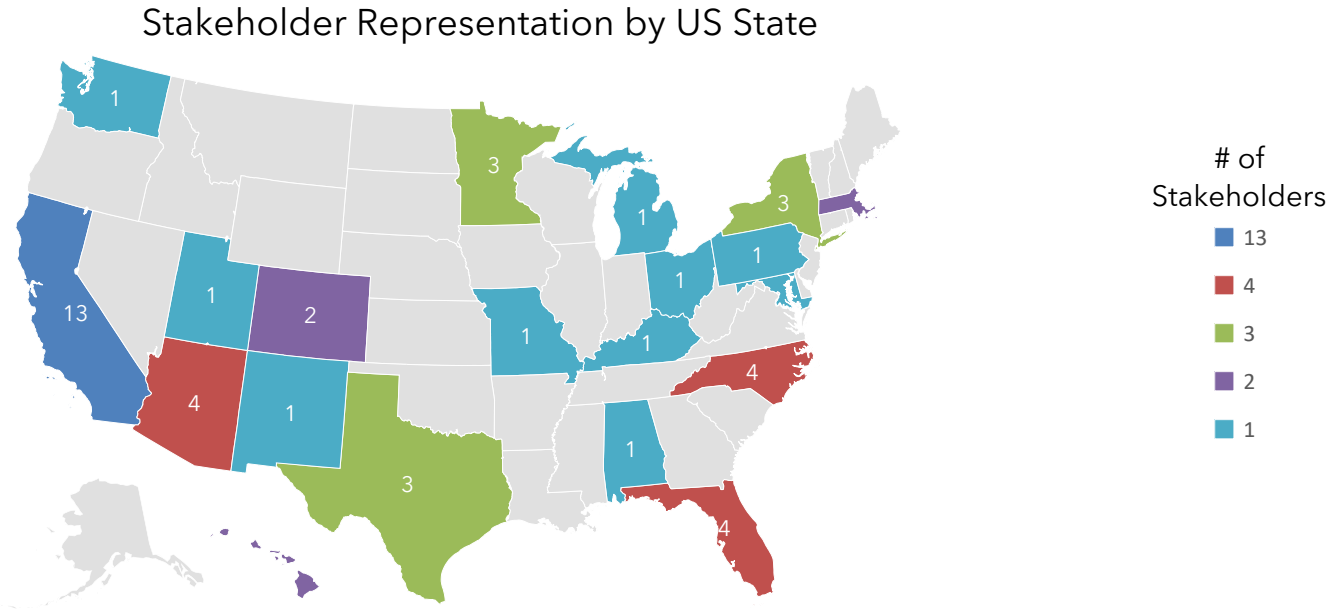


We reached out to 83 stakeholders from cities, industry associations, manufacturers, state/federal agencies, and other sectors

Stakeholder Group	#	Description
City Employee	29	Employee of a city government
Industry Association	17	Member-based national organizations for specific industries/ trades
State Energy Office	8	State and territory energy offices involved in energy efficiency and renewable energy programs
Cool Product Manufacturer	6	Organizations that design and/ or manufacture new “cool” products such as coatings, shingles, walls, etc.
Non-Profit + Think Tank	6	501(c)(3)s and other NGOs that focus on policy, research, and advocacy concerning topics related to cool surfaces
Researcher	6	Employee or organization who conducts research and organizes studies
Utility	4	State and local utility
Federal Employee	4	Employee of the federal government
Private Consultant	3	Private consultant
<b>Total</b>	<b>83</b>	<b>Total # of stakeholders contacted</b>



This included 50 stakeholders from 20 states, as well as 33 stakeholders from national organizations (not drawn below)

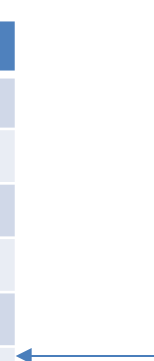


50 city/state stakeholders + 33 national stakeholders = 83 total stakeholders

# We have interviewed 46 stakeholders to date

Emailed	Responded	Interviewed
83	60 (72% response rate)	46 (55% interview rate)

Interviewed Stakeholder Group	#
City Employee	13
Industry Association	10
Cool Product Manufacturer	5
Non-Profit + Think Tank	5
Researcher	4
State Energy Office	3
Federal Employee	3
Utility	2
Private Consultant	2
<b>Total</b>	<b>46</b>



The three most common topics in the interviews were **① scaling-up pilots**, **② codes**, and **③ R&D**



# We compiled key takeaways from each interview— here are several examples of opportunities and barriers

Stakeholder	Key takeaway(s) from a single interview
<b>Federal Employee</b>	<b>Regulations and financial incentives will help to promote cool surfaces.</b>
City Employee	Vulnerability assessments and environmental justice mapping tools were critical in equitably allocating resources for cool roofs in NYC's low-income communities.
<b>Industry Association</b>	<b>Though specifiers of cool surfaces promote interest in the environment, how it benefits building owners is regarded as more important. Promote heat mitigation in urban areas.</b>
Cool Product Manufacturer	While raw material availability, shortage, and regulations can reduce demand for cool surfaces, increased awareness and code requirements can improve adoption of cool surfaces.
<b>Utility</b>	<b>Hot roofs don't rise to the top of issues for utilities to solve for buildings.</b>
State Energy Office	Challenges to cool-roof credits in California Title 24, Part 6 building energy efficiency standards include enforcing cool-surface regulations and availability of high-SR steep roofing products. Manufacturers are concerned about inability to meet SR requirements and losing California market share.





Over the next three months we will prepare a **report**, host a **stakeholder workshop**, and draft the **national deployment plan**



❶ Issue report (mid July)

❷ Host workshop (late July)

❸ Finalize plan (September)

# We will convene an online workshop for stakeholders on Thursday, July 28

## Program

- Discuss findings from literature review and stakeholder interviews
- Work in small and large groups to develop national deployment plan
- Engage and invest stakeholders in success of plan



To learn more about the workshop (likely to be invitation-only), please sign up at <https://bit.ly/3O8Eeqj> or email [HaleyGilbert@gmail.com](mailto:HaleyGilbert@gmail.com)

# Thank you!

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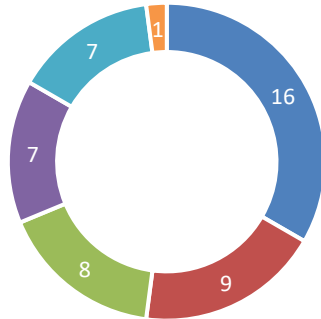
# Reference Slides



# Journal articles were the most common sources but we drew from a wide variety of publications

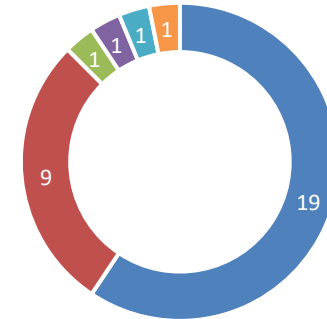
1. Reviewing the history of cool-surface deployment activities

- Journal
- Program guideline
- Building standard
- Conference paper
- Report
- Video Recording



2. Researching energy-efficiency/green building deployment models with successful track records

- Journal
- Report
- Conference paper
- Book Section
- Thesis
- Presentation



# General Observation for Cool Surfaces

## 1. Energy Saving

- a) Savings in all climates and conditions, savings on summertime air conditioning expenditures, and peak demand drives the savings.
- b) Example: Cocoa Beach, FL and Sacramento, CA studies show **20-70%** cooling energy savings during summer months

## 2. Challenges and Barriers

- a) High cost for any radiative cooling technology
- b) Durability and resistance over time
- c) Color requirement
- d) Environmental impact of paints

## 3. Urban Heat Island and Building

- a) **Reduces** building heat-gain
- b) **Improves** thermal comfort in non-AC buildings
- c) **Enhances** the life expectancy of the roof system
- d) **Reduces** air pollution and CO<sub>2</sub> emissions
- e) **Mitigates** the Heat Island Effect
- f) **Reduces** land surface temperature (LST)



# Cool Surfaces Rebate and Incentive Programs

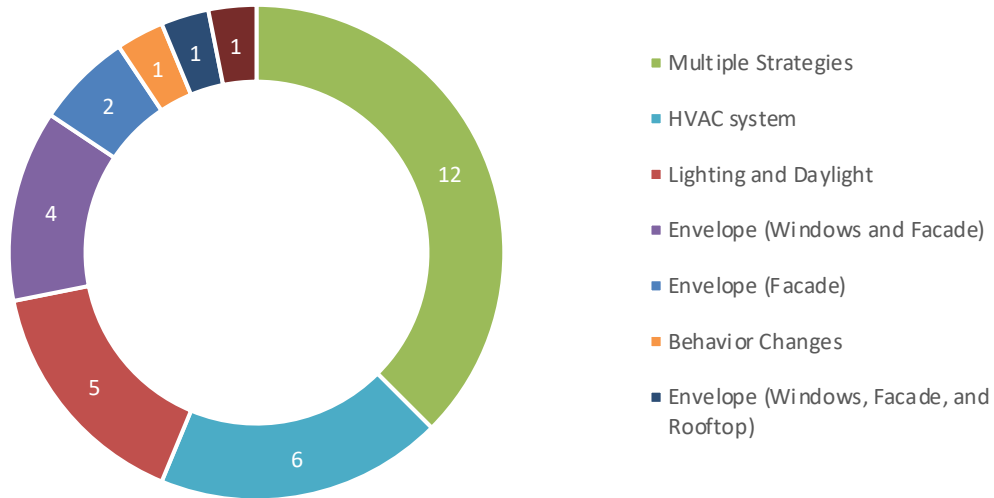
Source	Incentive/Rebate	Requirement	Application Status
Austin, TX	\$0.15/ft <sup>2</sup> product	Solar Reflectance >0.75	Open
Orlando Utilities Commission (FL)	\$0.12/ft <sup>2</sup> product	Solar Reflectance >0.70	Open
JEA (Jacksonville, FL)	\$0.10/ft <sup>2</sup> product \$0.15/ft <sup>2</sup> product (Small Business Enhanced Rebate)	Energy Star Reflective Roof Products Requirements	Open
Smyrna Beach, FL	\$0.14/ft <sup>2</sup> conditioned floor area up to \$375	Solar Reflectance >0.70	Open
Texas-New Mexico Power	\$0.04/kWh energy saving	Energy Star Qualified Cool Roof Products	Open
Louisville, KY	\$1.00/ft <sup>2</sup> product (up to \$2,000)	Solar Reflectance >0.65	Open
Los Angeles, CA	\$0.20 to \$0.30/ft <sup>2</sup> product	Solar Reflectance >0.75 for \$0.20 Solar Reflectance >0.85 for \$0.30	Open

# Cool Surface Codes and Standards

Codes and Standards	Requirement
<b>State of Alabama</b>	3-year aged solar reflectance of 0.55 and 3-year aged thermal emittance of 0.75
<b>California Title 24, Part 6</b>	Solar reflectance > 0.63 and a minimum thermal emittance > 0.75, or Solar Reflectance Index (SRI) > 75.
<b>Chula Vista, CA</b>	For steep slope roofs, install a roofing product rated by the Cool Roof Rating Council (CRRC) with an aged solar reflectance of 0.25 or higher and thermal emittance of 0.75 or higher.
<b>Atlanta, GA</b>	All building and structural roofs shall be constructed of a heat-reflective material to achieve a minimum initial SRI of 78 for a low-sloped roof (less than or equal to 2:12) and a minimum initial SRI of 29 for a steep-sloped roof (more than 2:12) except for those portions of roofing designated for vegetation.
<b>LEED BD+C: New Construction</b>	Solar reflectance $\geq$ 0.60 Thermal emittance $\geq$ 0.75



# Other Instructive Energy-Efficiency/Green Building Technologies



# General Observation for Energy-Efficiency/Green Building Technologies

## 1. Challenges and Barriers

### a) PV Technology

- **Cost:** High-cost
- **Durability:**
  - Cracking during transportation and/or installation, which requires each module to be tested and qualified individually.

### b) Renewable and Envelope

- **Measurement & Validation**
  - Results might not be able to be validated and compared in different years
  - Some of the strategies might not be accurately measured due to a lack of equipment

### c) Advanced Framing Technology

- **Cost:** High-cost
- **Education:** Contractors slow to learn how to install the products

## 2. Opportunities and Benefit

### a) Advanced Framing Technology

- **Efficient:** Using advanced technologies will help to save energy

### b) Integrated Electric Lighting and Daylight Technology:

- **Performance:** Meet or exceed energy-efficiency benchmarks, especially when designed for integration with other system
- **Education:** Educating the occupant on an easy-to-use and intuitive interface will increase the understating and acceptance of the system

