Global Cool Cities Alliance

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"Cool roofs are one of the quickest and lowest cost ways we can reduce our global carbon emissions and begin the hard work of slowing climate change."

—Dr. Steven Chu, US Energy Secretary

The planet is warming.

Greenhouse gases are warming our planet. According to the Intergovernmental Panel on Climate Change, the Earth's average temperature is on track to increase by between 2 and 7 degrees Celsius (4 to 13 degrees Fahrenheit) this century, producing a climate never before experienced by human civilization. This rapid change in temperature is not only stressing ecosystems, but is also increasing the frequency and duration of heat waves, creating serious health risks to people around the world.

Cool roofs and pavements can help cool things down.

Over 60 percent of urban surfaces are covered by roofs or pavements. About 20 to 25 percent are roofs and 30 to 45 percent are pavements. Because these surfaces are dark and typically absorb over 80 percent of sunlight, our built environment heats cities and exacerbates the warming effects of climate change. Replacing roofs and pavements with more reflective materials could reverse this warming, turning urban surfaces into an asset instead of a burden.

It's simple.

White roofs reflect more sunlight than dark roofs, turning less of the sun's energy into heat. Increasing the reflectance of our buildings and paved surfaces—whether through white surfaces or reflective colored surfaces—can reduce the temperature of buildings, cities, and even the entire planet.

Cooler Buildings

Highly reflective roofs can cool buildings, lowering their net energy use (cooling savings minus heating penalty) by 10 to 20 percent, if the building is air-conditioned.[1] On buildings without air conditioning, a white roof can reduce inside temperatures by 2 to 3 degrees Celsius (4 to 5 degrees Fahrenheit), making buildings more comfortable and possibly saving lives in extreme heat waves.

Cooler Cities

City-wide installations of reflective roofs and pavements reduce city temperatures. Studies show that cool surfaces, along with the planting of shade trees, can reduce a city's air temperature by 2 to 3 degrees Celsius (4 to 5 degrees Fahrenheit), in summer months.[2] This reduction not only makes the city more comfortable, but also improves the air quality because smog forms more readily on hot days. According to a study of the Los Angeles basin, a combination of lighter surfaces and shade trees could reduce exposure to unhealthy air by 10 percent.[3]

Cooler Planet

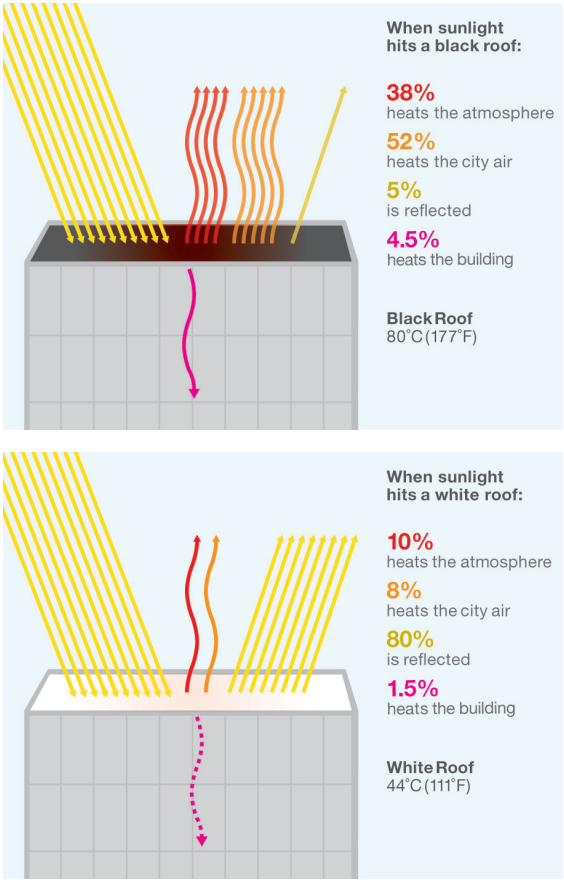
Permanently replacing the world's roofs and pavements with highly reflective materials will have a cooling effect equivalent to reducing green house gas emissions by 44 billion tonnes of CO_2, an amount roughly equal to one year of global man-made emissions.[4] Assuming the average car emits 4 tonnes of CO_2 per year, these savings are roughly equivalent to taking all of the world's approximately 1 billion cars off the road for 11 years.

1. H. Akbari et al. 2009. Global cooling: increasing world-wide urban albedos to offset CO_2. *Climatic Change* Volume 94, Numbers 3–4, 275–286. doi: 10.1007/s10584-008-9515-9

2. H. Akbari et al. 2001. Cool surfaces and shade trees to reduce energy use and improve air quality in urban areas" *Solar Energy* Volume 70, Number 3, 295–310. doi: 10.1016/S0038-092X(00)00089-X

3. H. Taha. 1997. Modeling the impacts of large-scale albedo changes on ozone air quality in the south coast air basin. *Atmospheric Environment*,Volume 31, Number 11, 1667–1676. doi: 10.1016/S1352-2310(96)00336-6

4. Akbari et al. 2009.



Above: A white roof (bottom) in temperate or tropical regions absorbs about 80% less sunlight than a black roof (top). Right: Former Vice President Al Gore and New York City Mayor Michael Bloomberg kick off the NYC °CoolRoofs initiative which has successfully met its goal of installing 1 million square feet of cool roofs in 2010. ©NYC.gov, photo by Edward Reed

5. The US average annual energy cost saving (cooling energy saving—heating energy penalty) for a white roof on a commercial building is $0.36/m^2 ($0.033/ft^2) (Levinson and Akbari 2010). doi: 10.1007/s12053-008-9038-2

6. R. Levinson and H. Akbari. 2010. Potential benefits of cool roofs on commercial buildings: conserving energy, saving money, and reducing emission of greenhouse gases and air pollutants. *Energy Efficiency*, Volume 3, Number 1, 53-109. doi: 10.1007/s12053-008-9038-2

7. Akbari et al 2001.

It's cheap.

Cool roofs are a low or even negative-cost way to mitigate climate change. Depending on the materials used, the added cost to choose a white roof instead of a dark roof for a commercial building is about $0–$2.20/m^2 ($0–$0.20/ft^2), resulting in a US average simple payback period of zero to six years through energy savings.[5] Retrofitting 80% of the 2.58 billion square meters of commercial building roof area in the US would yield net energy cost savings of $735 million, and offer an annual CO_2 reduction of 6.23mt.[6] More importantly, cooler cities have less smog and are healthier. According to one study, as much as $10 billion per year could be saved in health care costs if cities implemented with cooler surfaces.[7]

The world is rapidly awakening to the benefits of cool roofs.

- On June 1, 2010, US Secretary of Energy Dr. Steven Chu announced several steps to implement cool roofs at the US Department of Energy (DOE) and beyond.
- New York City exceeded its goal of installing one million square feet of cool roofs in 2010.
- In May 2010, Philadelphia mandated vegetative or highly reflective roofs on all new low-sloped buildings.
- California's "Title 24" Building Energy Efficiency Standards have required white roofs for commercial building with low-sloped roofs since 2005 and on some residential buildings since 2008.
- In 2007, India enacted a voluntary national building code that includes cool roofs.

Global Cool Cities Alliance will accelerate a world-wide transition to highly reflective cities.

Global Cool Cities Alliance is dedicated to advancing policies and actions that increase the solar reflectance of our buildings and pavements as a low- or no-cost way to promote cool buildings, cool cities, and, most importantly, to mitigate the effects of climate change through global cooling.

Global Cool Cities Alliance (GCCA) is developing four programs to accelerate the adoption of cool roofs:

- **100 Cool Cities** Recruit and obtain commitments from 100 major cities—*100 Cool Cities*—across the globe by 2015, with widespread installation of cool surfaces by 2020.
- **Corporate leadership** Support the voluntary adoption of cool surfaces by commercial and industrial building owners, with 20 major global corporations actively committed to cool roofs and pavement installation by 2013.
- **Building codes and pavement specifications** Promote the inclusion, by 2015, of cool surfaces—mainly white roofs—in the building codes and pavement specifications of key US states and major foreign countries.
- **Financial mechanisms** Develop financial mechanisms, by 2015, that broadly support the installation of cool surfaces in the US and other key countries.
- **Dissemination of research and development** Ensure that information about cool surface research, development, and demonstrations is broadly disseminated.

Global Cool Cities Alliance was launched in June of 2010 and is growing its programs. Already, GCCA has secured five founding partner cities—Athens, Chicago, New York City, Singapore, and Taipei.

Global Cool Cities Alliance invites you to join our effort. Please find us online at GlobalCoolCities.org

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