



EPA Heat Island Reduction Program

June 17, 2009

Cool Roof Rating Council
Annual Membership Meeting
Reno, Nevada

EPA Heat Island Program Manager: Neelam R. Patel



Outline



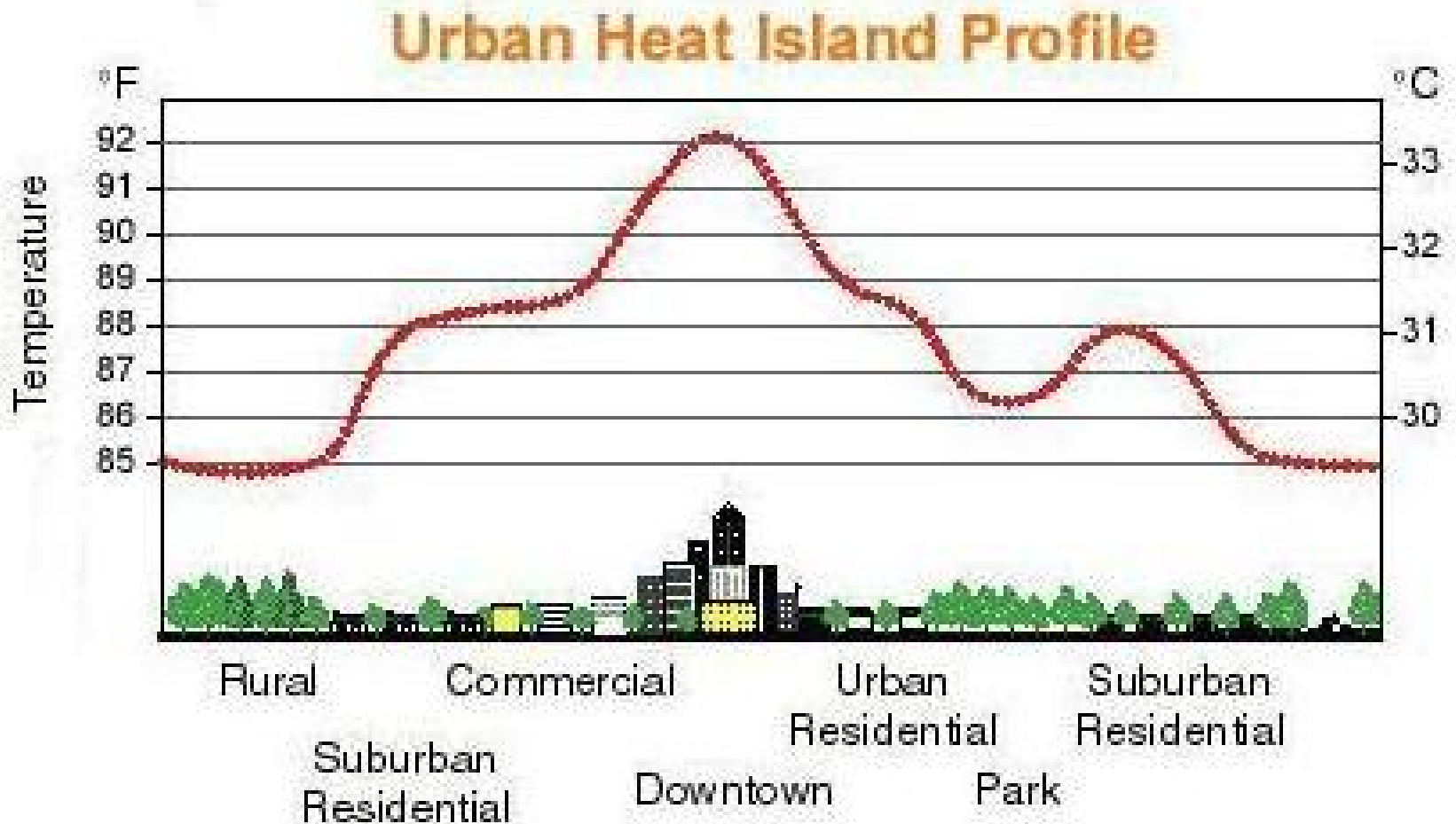
- Heat Island Overview
- EPA Heat Island Reduction Program
 - Program Resources
 - Future Direction
- New Opportunities for Cool Roofing
 - Legislative Activity
 - Recent Scientific Developments
 - Energy Efficiency and Climate Mitigation Grant Funding



Definition



- Micro-scale temperature differences between urban and rural areas
- Urban areas can be 9 – 27 ° F higher than rural areas



Formation



Formation of Urban Heat Islands

- Reduced vegetation
- Materials used to build urban infrastructure
- Urban geometry



Energy and Air Quality Impacts



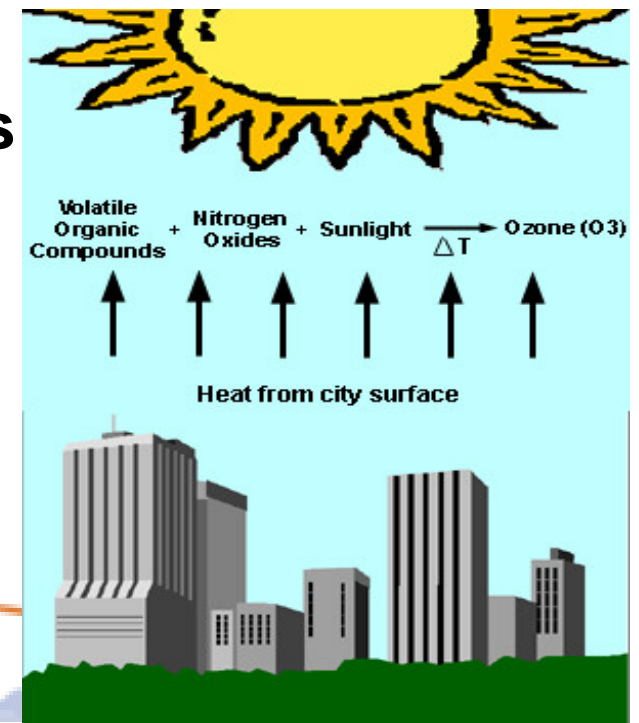
Impacts

■ Increased energy use

- 5 – 10 % of electricity demand is to cool heat islands effects
- 1.5 – 2.0% E demand ↑ for every 1 °F ↑ in the summer
- Longer peak periods; pressure on E grid; brownouts, blackouts

■ Air quality and greenhouse gas (GHG) emissions

- Ozone formation
- Increased air pollution
- Increased GHG emissions



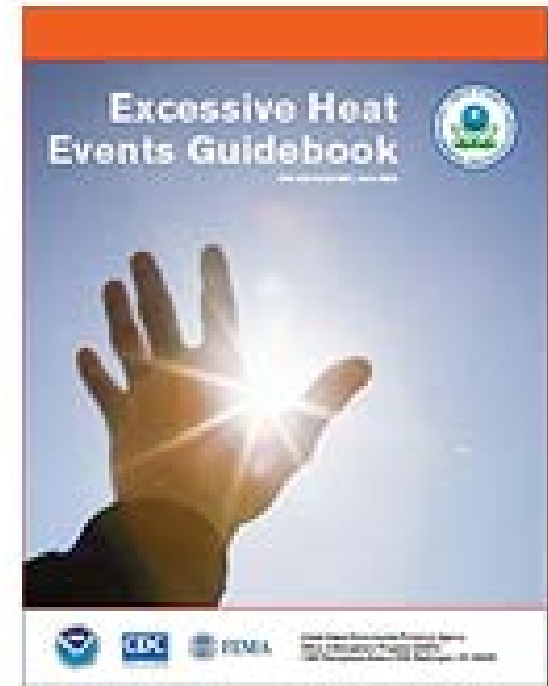
More Impacts



Impacts cont'd

■ Human Health

- Respiratory difficulties
- Heat cramps
- Heat exhaustion
- Non-fatal heat stroke/sun stroke
- Heat related mortality



■ Water Quality

- Warmer water runoff = ecological shock in waterways
- Increased water runoff = more pollutants in waterways

Mitigation Strategies



Communities can take action to reduce urban heat islands using four main strategies.

- Trees and Vegetation
- Green Roofs
- Cool Roofs
- Cool Pavements



Mitigation Strategy: Trees and Vegetation



Most U.S. communities have opportunities to increase the use of trees and vegetation in their land cover to reap multiple benefits.

Strategically planting trees maximizes energy savings and reduce GHG emissions (among other things).

- Buildings
- Parking lots
- Streets
- and more



Mitigation Strategy: Green Roofs



Green roofs decrease heat island impacts by shading roof surfaces and through evapotranspiration.

Generally, green roofs can save energy both in the summer and winter. Energy savings depend on local conditions and building circumstances.

Green roofs can be installed on a wide range of buildings, from industrial facilities to private residences.

Green Roof Types

- **Extensive** - 2-inch covering of hardy groundcover
- **Intensive** - complex as a fully accessible park complete with trees



Mitigation Strategy: Cool Roofs



Cool roofing products are made of highly reflective and emissive materials that can remain approximately 50 to 60°F (28-33°C) cooler than traditional materials during peak summer weather.

Cool Roof Types

- Low-sloped roofs
 - Coatings
 - Single ply membrane
- Steep-sloped roofs
 - Asphalt shingles
 - Metal roofing
 - Tiles
 - Shakes



Cool Roofs vs. Green Roofs



Different options for different motivations – each has different costs and performance implications

Cool Roofs

- Minimal incremental **cost** (compared to conventional equivalents)
- Selected by those focused primarily on energy savings or reducing peak energy demand

Green Roofs

- Initial costs are higher (costs depend on type of green roof)
- Selected by those interested in additional environmental benefits, i.e., stormwater management, natural habitat, green space

Mitigation Strategy: Cool Pavements



Cool pavements range of established and emerging materials. These pavements tend to store less heat and have lower surface temperatures compared with conventional products.

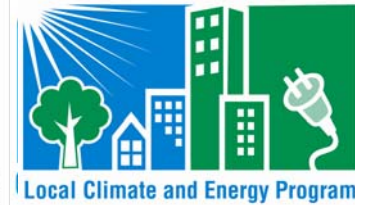
Unlike cool roofs, cool pavements do not have standards or an official definition.

EPA Pavement Activities:

- Hosted Cool Pavements workshop in 2005, helped identify future research areas
- Created the Transportation Research Board Subcommittee Meeting: Pavements and the Urban Climate, encourages further pavement research



EPA Heat Island Reduction Program



Program Objective

- Communicate policy, programmatic developments, and scientific, technological advancements to heat island community

Program Community

- Policymakers, program designers and program implementers
- Researchers/academia
- Industry, developers of new technology
- General public (e.g., K-12 students and teachers, coaches)
- Media



Messages to Heat Island Community



Topics of Interest to Scientific Community

- Heat island science, modeling, and measurement
- Innovative mitigation technologies in areas such as cool pavements, cool roofs, green roofs, and trees and vegetation

Activities for Programmatic and Policy Community

Voluntary Efforts

- Urban Forestry Programs
- Demonstration Projects (i.e., LBE)
- Weatherization
- Outreach and Education Programs
- Awards

Policy Efforts

- Procurement
- Resolutions
- Tree and Landscaping Ordinances
- Comprehensive Plans and Design Guidelines
- Zoning Codes
- Green Building Standards
- Building Codes
- Air Quality Requirements

Key Program Features

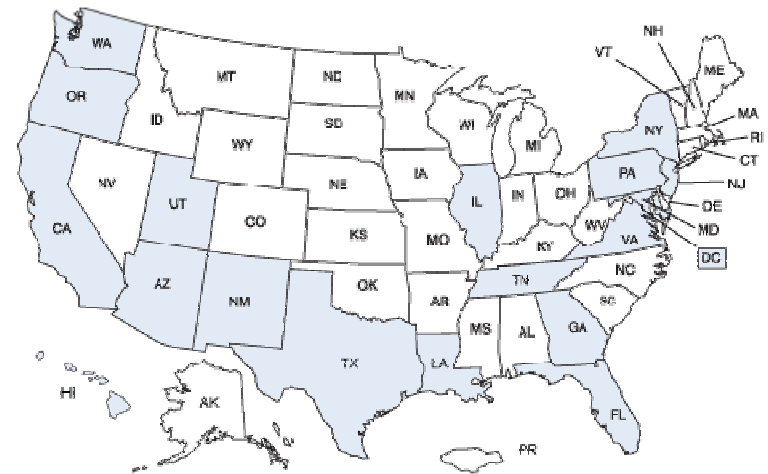


- **Website**, recently re-launched website, new features include user-friendly format, updated content, calendar of events, heat island in the news, featured webcast, updated database
- **Database**, “Where You Live”
 - Provides info on more than 75 local and statewide initiatives to reduce heat islands and achieve related benefits (*more on upcoming slide*)
- **Compendium of Strategies: Reducing Urban Heat Islands**
 - Document describes the causes and impacts of summertime urban heat islands and promotes strategies for lowering temperatures (*more on upcoming slide*)
- **Webcasts**, www.epa.gov/heatislands/resources/webcasts.htm
 - Quarterly online meetings for our diverse program audience spotlighting local/regional urban heat island programs, new scientific findings, and upcoming meetings
- **Listserve**, email EPA_heatisland_subscribe@icfi.com
 - Disseminates info to heat island community, e.g., funding opportunities, conference call for papers, webcasts, and more

Database



- Actions listed in the database are some efforts underway to cool communities while saving energy, reducing greenhouse gas emissions and improving air quality
- Each entry in the database includes a description of the activity, its current status, and a link to a website (if available) for more information.
- The database can be searched by:
 - Clicking on U.S. map (diagram on right)
 - State and locality
 - Initiative Type
 - Strategy
- If you are aware of heat island initiatives, please submit through our website.
http://yosemite.epa.gov/gw/statepolicyactions.nsf/webpages/HIRI_Initiatives.html

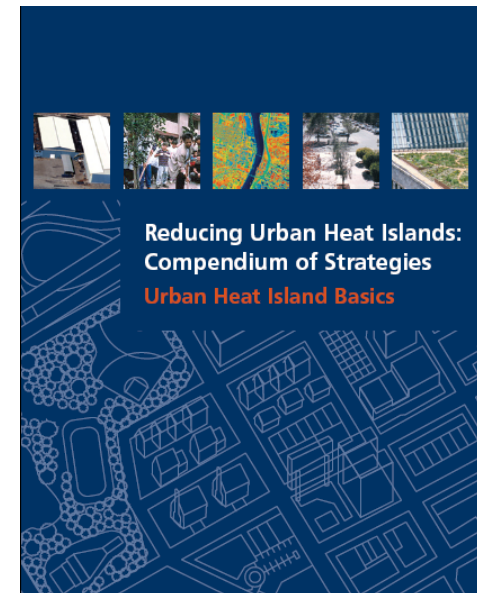


Compendium



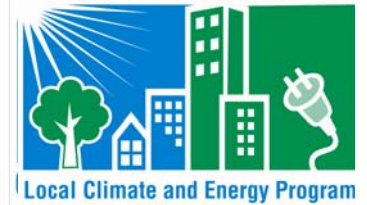
Reducing Urban Heat Islands: Compendium of Strategies

- Provides an overview of latest science, mitigation strategies, case studies, and recommendations for additional resources
- Chapters
 - Heat Island Basics
 - Trees and Vegetation
 - Green Roofs
 - Cool Roofs
 - Cool Pavements
 - Heat Island Reduction Activities



www.epa.gov/heatislands/resources/compendium.htm

Webcasts



- EPA holds free, national, routine heat island webcasts.
- Stakeholders from around the country inform each other of their urban heat island-related work.
- Scientists, practitioners, industry representatives, and government officials and staff all participate.
- Webcasts cover topics such as:
 - Measuring and Modeling Urban Heat Islands
 - Heat Island Impacts (e.g., air, water quality)
 - Mitigation (e.g., strategies, technologies, activities)
- Upcoming Webcast: Pavements, early August

<http://www.epa.gov/heatisland/resources/webcasts.htm>



Program Direction



- Fold heat island messages into other EPA programs to promote multiple benefits of mitigation strategies
 - Stormwater Green Infrastructure Program
 - Green Scapes Program
 - Smart Growth, www.epa.gov/hiri/resources/pdf/smartgrowthheatislands.pdf
 - Brownfields Redevelopment
 - Green Building activities at EPA

- Link to climate adaptation issues
 - Promote mitigation strategies to address heat health, energy conservation, and climate mitigation for local, regional and state programs
 - Use mitigation strategies to support actions for extreme weather (high rainfall, heat)



Other EPA Heat Island Activities



- EPA Regional Heat Island Activities – *Sustainable Skylines Initiative*

- Development and implementation of heat island mitigation program Dallas, TX

www.sustainableskylines.org/Dallas



- Development of program, “Parking Lots to Parks” Kansas City, KS and MO

www.epa.gov/region07/citizens/ssi.htm



EPA Energy STAR Roofing Products



- Energy STAR certifies roofing products that are more energy efficient than standard products translating to money and energy savings.
- Specifications – products must meet solar reflectance criteria determined by EPA.
- Energy STAR has 237 partners. Product list was updated 6/1/09
- Roofing Calculators
 - Energy STAR Roofing Comparison Calculator
www.roofcalc.com
 - DOE Steep-slope Roof Calculator -
www.ornl.gov/sci/roofs+walls/SteepSlopeCalc/index.htm
 - DOE Flat Roof Calculator -
www.ornl.gov/sci/roofs+walls/facts/CoolCalcEnergy.htm

New Opportunities for Cool Roofing

New Opportunities for Cool Roofing



- Legislative Activity
- Scientific Developments
- Energy Efficiency & Climate Mitigation Grant Funding

Legislative Activity



Waxman- Markey Bill

American Clean Energy and Security Act 2009 (ACESA)

- Discussion draft introduced March 31, 2009
- Revised version introduced to House Committee on Energy and Commerce May 15, 2009
- Approved by House Committee on Energy and Commerce May 21, 2009

- If enacted, the bill would:
 - Advance energy efficiency and reduce reliance on oil
 - Create an economy-wide cap and trade program
 - Stimulate innovation in clean coal technology
 - Accelerate use of renewable energy sources
 - Create strong demand for clean energy technologies and assist economic recovery and job growth

Legislative Activity



Waxman- Markey Bill (5/21/09)

American Clean Energy and Security Act 2009 (ACESA)

- Title I – Clean Energy
- Title II – Energy Efficiency
- Title III – Reducing Global Warming Pollution
- Title IV – Transitioning to a Clean Energy Economy

Scientific Developments



- Scientific article published in *Climatic Change* journal, May/June 2009 issue
Global cooling: Increasing world-wide urban albedos to offset CO₂, by Hashem Akbari, Surabi Menon, Arthur Rosenfeld
- Findings: In addition to the energy efficiency benefits, white roofs cool the world directly, and offset an order of magnitude more CO₂ than is avoided by reduced A/C local.
- Message from authors: This raises the priority for white and cool colored roofs both in the US and in major developing country cities.

Scientific Developments



- Steven Chu, the US Secretary of Energy and a Nobel prize-winning scientist, said “Making roofs and pavements white or light-coloured would be the equivalent of taking all the cars in the world off the road for 11 years.”
- "What we're doing is that, as we put in more greenhouse gases, we're putting in more insulation for infrared light [heat]. So if you make white roofs and the sunlight comes in, it goes right through that [insulation]..”



American Recovery and Reinvestment Act (ARRA) 2009 Funding



Recovery Act

- Transparency & accountability



Strategic Energy

- Invest funds to stimulate economy now **and** meet long-term energy goals
- Create comprehensive energy programs/strategies with aggressive goals and benchmarks of current performance
- Develop programs and projects that will persist beyond grant period
- Leverage funds with public and private sources
- Coordinate across regions, states and local jurisdictions

ARRA 2009 Funding - DOE



DOE Energy Efficiency and Renewable Energy Office received \$16.8 B

- Weatherization \$5.0B
- State Energy Program \$3.1B
- EECBG Program Formula \$2.8B
- EECBG Competitive \$400M
- Appliance Rebate Program \$300M



ARRA Tax Credits - Roofing



- Under ARRA 2009, a 30% tax credit (with the limit of \$1,500) is available for Energy STAR labeled metal and asphalt roofs.
 - Installation costs are not covered.
 - Material must be expected to last 5 years or have a two-year warranty.
 - Note: \$1,500 applies to all energy efficiency improvements combined.



EPA Climate Showcase Communities Grant



Awarded in 2009 Appropriation, not ARRA related

- \$10M Competitive grant to assist local and tribal communities in implementing climate change initiatives
- Goal is to achieve documentable, replicable GHG reductions from a range of activities and community types
- Program will:
 - Create lasting greenhouse gas reductions
 - Foster collaborative partnership between communities and the Federal government
 - Promote transfer of best practices among localities
 - Emphasize co-benefits of climate action
- Solicitation opened June 15, 2009. Will close July 22, 2009 at 4pm EST

Contact Info



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