

Urban Heat Island Policies

State Clean Energy-Environment
Technical Forum

May 10, 2007

David Hitchcock, AICP
dhitchcock@harc.edu

Director, Sustainable Transportation Programs
Houston Advanced Research Center



*Moving knowledge to action
to improve human well-being
and the environment*



Introduction

- David Hitchcock, AICP
 - **urban planner**: regional development, sustainable transportation, and energy/air quality
 - directing new transportation/air quality research program (**Joint Center**) focused on place-based strategies for the Houston and Dallas/Ft. Worth regions: <http://www.harc.edu/jointcenter>
 - **urban heat island involvement** since 1998 through NASA, EPA, Texas Forest Service, and various community studies
 - baseline heat island information on Houston leading to **Cool Houston Program** and **Plan** as a regional initiative: <http://www.harc.edu/coolhouston>
- HARC
 - **non-profit research organization** with a mission of **sustainable development**: <http://www.harc.edu>
 - founded in 1982 with four founding Texas universities; located in The Woodlands, Texas: <http://www.thewoodlands.com>
 - lead **research management entity** for Texas air quality research and technology development: <http://www.tercairquality.org> or <http://www.harc.edu/OurWork/AirClimate>
- HARC Programs
 - **sustainable energy**/clean energy/nanotechnologies/hydrogen/fuel cells/biofuels
 - **human health**/DNA/toxicogenomics/nanotoxins
 - **air and climate** research/sustainable transportation/new technology R&D/biofuels
 - **green buildings** and materials/energy efficiency

State and Local Policies for Urban Heat Island Mitigation



- State/local policies on UHI include:
 1. Formal resolutions
 2. Urban and regional plans
 3. Air quality policies or regulations
 4. Other regulatory instruments including:
 1. procurement
 2. development controls
 3. various codes or ordinances
- Examples of each are identified.



Cool Houston Plan

- Example of a more comprehensive approach for local or regional use
- Provides basic information on UHI and mitigation
 - accurate background information
 - mitigation technologies
 - relevant conditions/data for the region
 - potential actions to address UHI
- Comprehensive in scope so that multiple audiences can participate
- Serves as a spring board for participation
- Downside:
 - needs substantial input if no studies have been done
 - needs to apply to local circumstances
 - lacks official adoption
 - needs someone to provide continuity



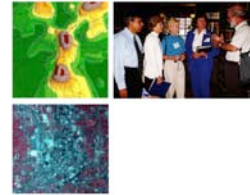
Cool Houston Origins

- 1995 - 2000: EPA Concept of comparative risk analysis led by HARC: Houston Foresight
- 1999: Houston Cool and Green! Workshop: NASA, USDA, DOE and others
- 2000 - 2006: Houston Green; Texas Forest Service, U.S. Forest Service, and HARC
- 2001 - 2006 Cool Houston!
- Regional--Federal--non-profit links
- Science and analysis into stakeholder based regional policy arena
- Many funding sources: Federal funds, seed funds plus foundation grants
- Non-profit research oriented leadership with substantial community support and involvement

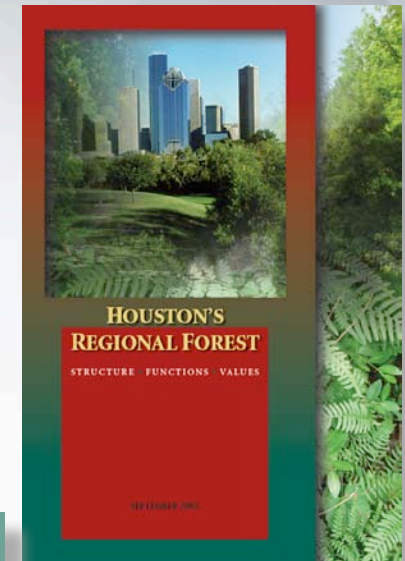
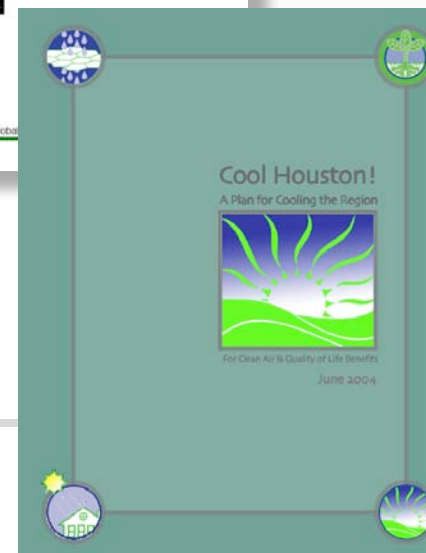


Workshop Summary Report

Houston Cool and Green!
A Workshop on Climate Variability in the Houston Region
New Technologies • New Opportunities
Houston Advanced Research Center, The Woodlands, Texas
May 24 and 25, 1999



Organized by Sustainable Enterprise Institute and HARC Center for Global





Cool Houston Approach

- Based on understanding of regional conditions and likelihood of action from several years of discussions and participation in related activities
- Stretches boundaries of action, but not too much
- Identifies key decision points and key actors making decisions on mitigation measures - not necessarily traditional elected officials or agency heads
- Differentiates stakeholders across mitigation measures -
 - Roofing interests may not care about planting trees.
 - Paved surface decisions tend to be highly differentiated between public sector (roads) and private sector (parking lots).
 - Changing the surface characteristics in a region (many cities/unincorporated areas) requires very different strategies from changing a single city's surfaces.



Policy Bottom Line

- Urban heat island (UHI) effects and mitigation are **multifaceted**, hence relevant to a wide range of state and local policies: from features of my yard to global warming.
- UHI is often included as a related or supportive policy component:
 - “Street trees are hereby required on all major arterials at a spacing of 25 feet because research has found that trees improve the quality of life, reduce urban runoff, lessen flooding, increase property values, help the local economy, create jobs, **and** mitigate the urban heat island effect.”
Homer Simpson, Springfield, 1984 (original text by Lisa Simpson)
- Comprehensive, detailed UHI policies are an exception.



Table of Identified Policies by Type and Mitigation

Policy Area	35	Vegetation	8	Roofing	10	Paving	6	Mixed	12
Formal Resolution	6	SCAG Seattle South Carolina	3	Cambridge	1	Burbank	1	ICLEI Austin Tokyo	1
Urban and Regional Plans	3		0		0		0	Gilbert, AZ Forsythe County, CA Ft. Worth, TX	3
Air Quality	7		0	California	1		0	Houston Dallas/Ft. Worth Sacramento Atlanta New York Washington Metro COG	6
Regulatory	19	Highland, UT Atlanta Sacramento Baton Rouge Tempe	4.5	Tucson Houston Portland Germany California Florida Chicago Dallas/Fort Worth	8	Highland, UT Ann Arbor Woodbury, MN Auburn, GA Tempe	4.5	Atlanta? Houston?	2

Shaded Letters: other non-US, non-govt. examples

This information was compiled from a scan of literature, web searches, and previous heat island research at HARC.



1. Formal Resolutions

- Local governments have adopted heat island resolutions acknowledging UHI effects and concerns.
- A low-risk approach for elected officials with the opportunity for improving community and leader awareness and for follow-up action.
- Resolutions can be comprehensive or focused on specific measures.
- Examples
 - ICLEI Model Resolution
 - Austin, Texas
 - Cambridge, MA
 - Metropolitan Tokyo

2. Urban and Regional Plans



- Plans include longer-range considerations for urban and regional development that incorporate UHI effects or mitigation.
- UHI in plans as support for other plan goals and elements
- May be comprehensive or applied to specific plan components--serving as basis for design standards, zoning incentives, or subdivision regulations.
- Examples:
 - Gilbert, Arizona: a goal
 - Southern California Regional Association of Governments: directive for assessment of heat island strategies
 - City of Seattle: directional goal
 - State of South Carolina: directional for local governments
 - Forsythe County, California: as a policy promotion
 - City of Fort Worth, Texas: directional goal as energy component

3. Air Quality



- Simple on its face – hotter cities = worse air quality. Solution: lower temperatures will help.
- But, complex under federal SIP policies with current air quality modeling tools, although EPA has provided good opportunities for regions or states choosing to incorporate UHI measures.
 - Example: shade, cool roofs, and cool paving reduce energy demand and thereby reduce emissions at “the power plant”. Air quality modeling and SIP criteria ask “which power plant?”
- Air quality and energy policies at the State level occur in very different policy arenas
 - air quality policies are often found in state (or local) regulatory setting,
 - while state energy policies and programs are found in public utility agencies, transportation agencies, (now) agriculture, and economic development agencies.
- Examples for SIP Efforts:
 - Houston, Dallas/Ft. Worth, Sacramento, Baltimore, DC metro region, Los Angeles, Atlanta, New York City region
- Reframing UHI Policy Issues



4. Other Regulatory Options

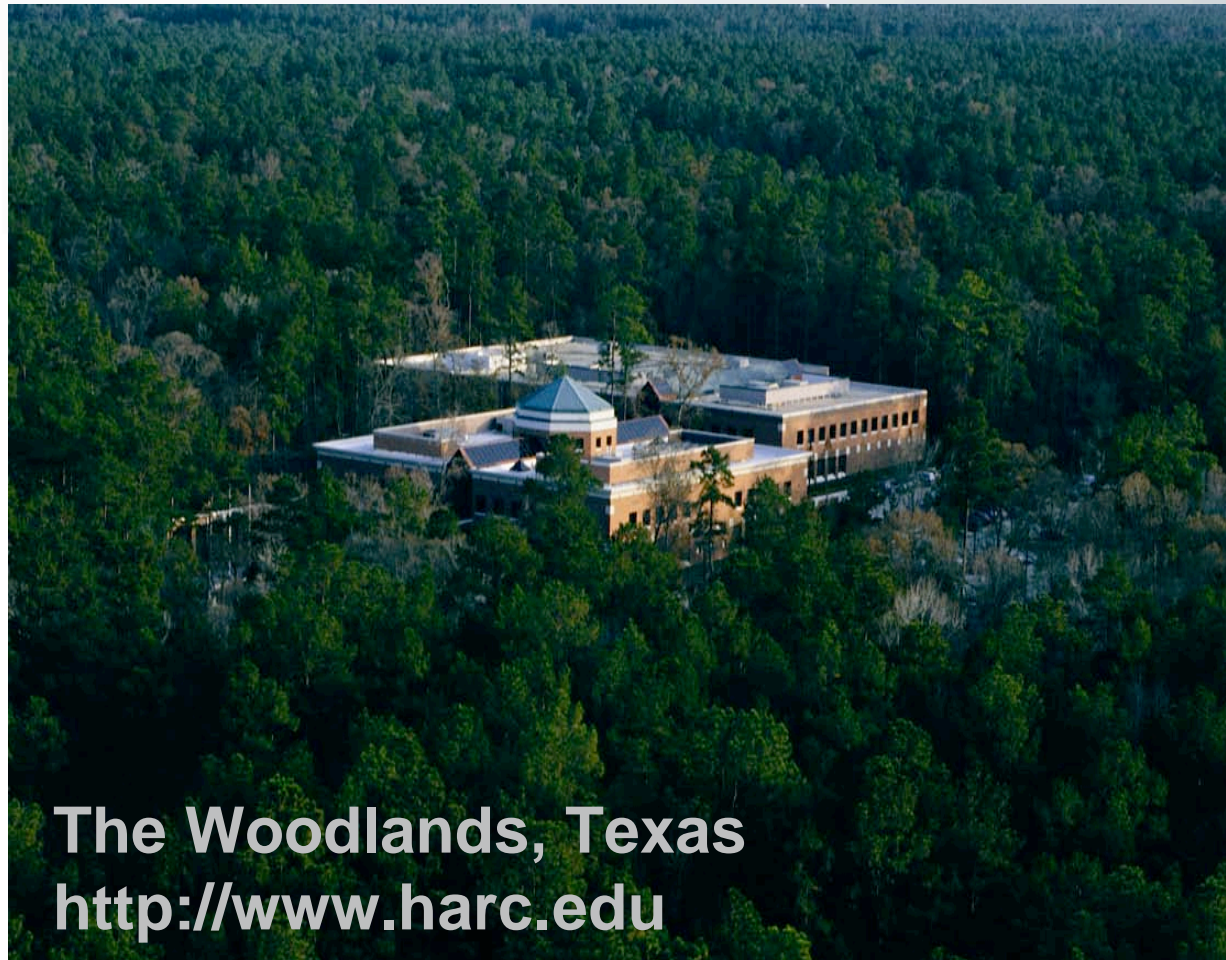
- Procurement Policies
 - EnergyStar® and LEED® standards provide procurement options for state and local governments
 - Locally developed procurement policies can specify use of mitigation technologies.
 - Policies can be used by most governmental entities, such as school districts, for energy savings and to provide leadership
- Development Guides/Controls
 - Tree and Landscape Ordinances
 - Tree protection
 - Street trees
 - Parking lot trees
 - Development landscaping requirements
 - Zoning Regulations
- Building and Energy Codes



Discussion/Questions

- Policy drivers: some aspects of a **perfect policy storm**
 - energy prices/grid resiliency, rapid growth in climate change awareness, difficulty (and failures) in meeting air quality standards, green building successes
- First steps/low hanging fruit:
 - **connecting the dots with stakeholders** - energy • air • smart growth • green buildings • climate change • habitat • etc • etc
 - Or, **connecting UHI concepts with one excellent dot** that has traction. Could be landscape requirements or saving energy or green buildings or carbon offsets or development codes or a new planning process. Identify something and build UHI into this opportunity.
- Primary challenges for heat island reduction:
 - the extent and rapidity of urban surface changes and the level of mitigation needed for measurable thermal changes.
 - having an informed presence at state or local levels for a continued UHI dialogue (someone always there for information and to participate in diverse activities).
Whose issue is this anyway?
- Lessons Learned
 - California Title 24 Cool Roof prescriptive regulations; copy and repeat.
 - EnergyStar® and LEED® – good models for promulgating UHI technologies.

Houston Advanced Research Center



The Woodlands, Texas
<http://www.harc.edu>

Cool Houston Plan
<http://www.harc.edu/coolhouston>