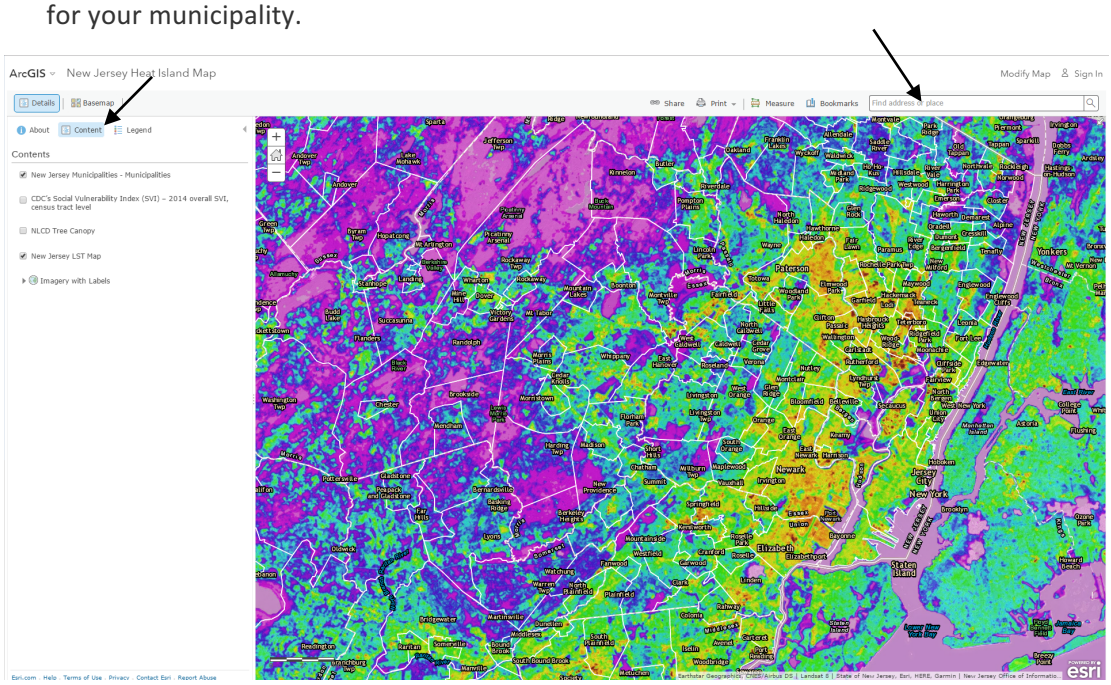
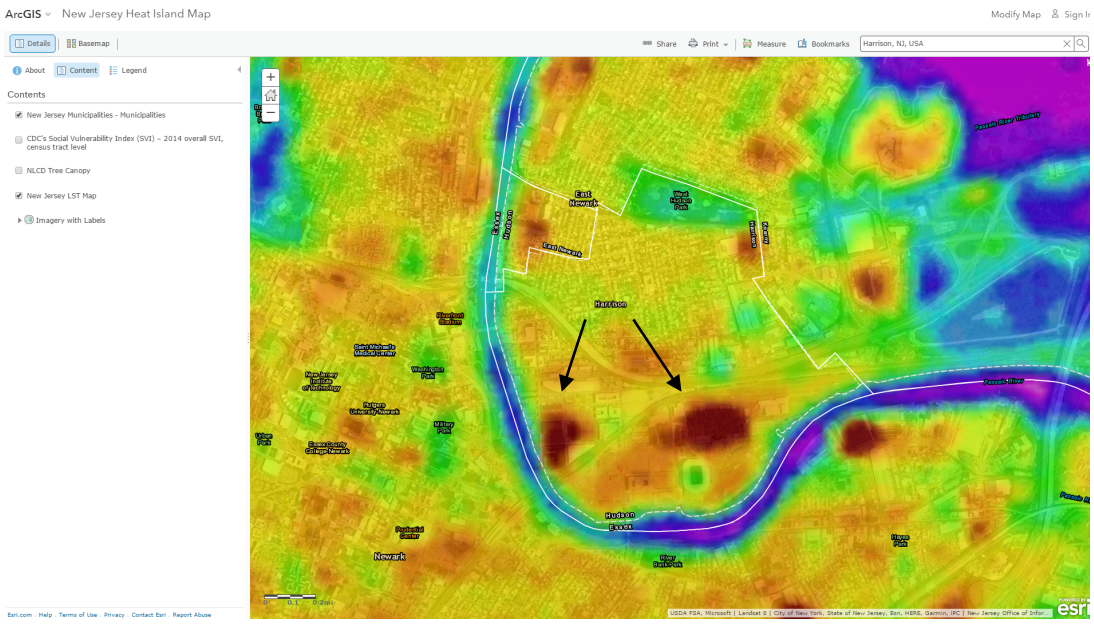
A. Steps to assessing your community for Heat Island Effect (with screenshots)

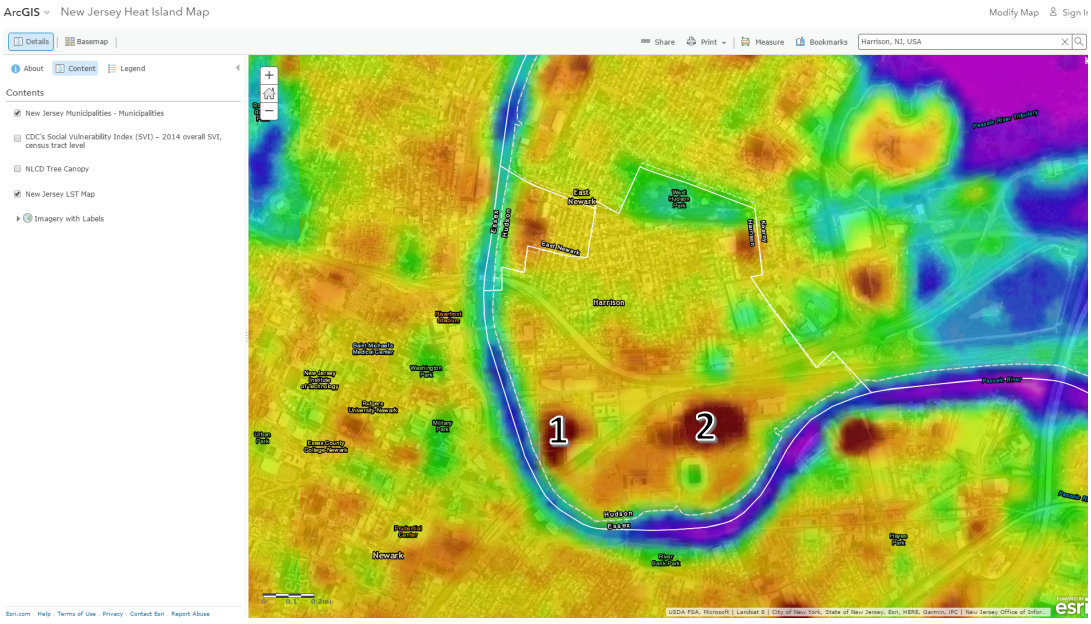
1. Go to **New Jersey Heat Island Map** switch the details sidebar to "Content" and zoom to or search for your municipality.



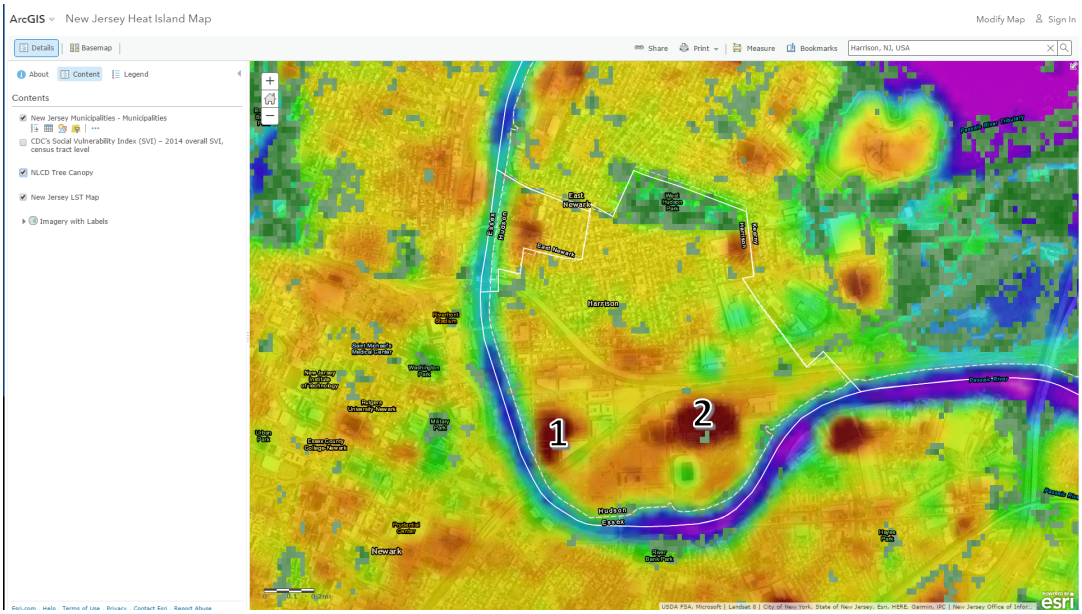
2. Determine whether your community has any urban heat islands. If there is yellow, orange or red on the UHI map, your community has some degree of UHI effects. Take a screenshot of the entire municipality, and paste/drop the image into a Microsoft Word document. **NOTE:** If there are no orange or red areas on the map, your community probably does not have any heat islands and there is no need to complete this action.

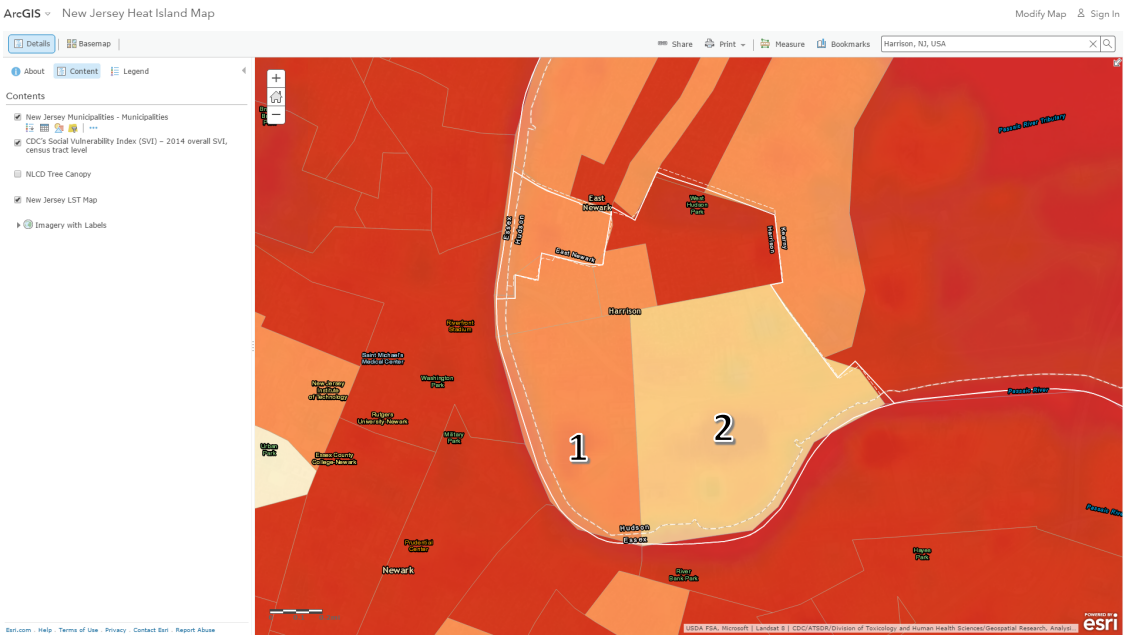


3. Locate and label the heat islands, or “hot spots”, in your community. Hot spots refer to the areas of concentrated heat as a result of the urban heat island effect (UHI) and are shown in orange and red. Place numbers on the darkest red spots as a reference for the next step. (Very small spots do not need to be identified.)

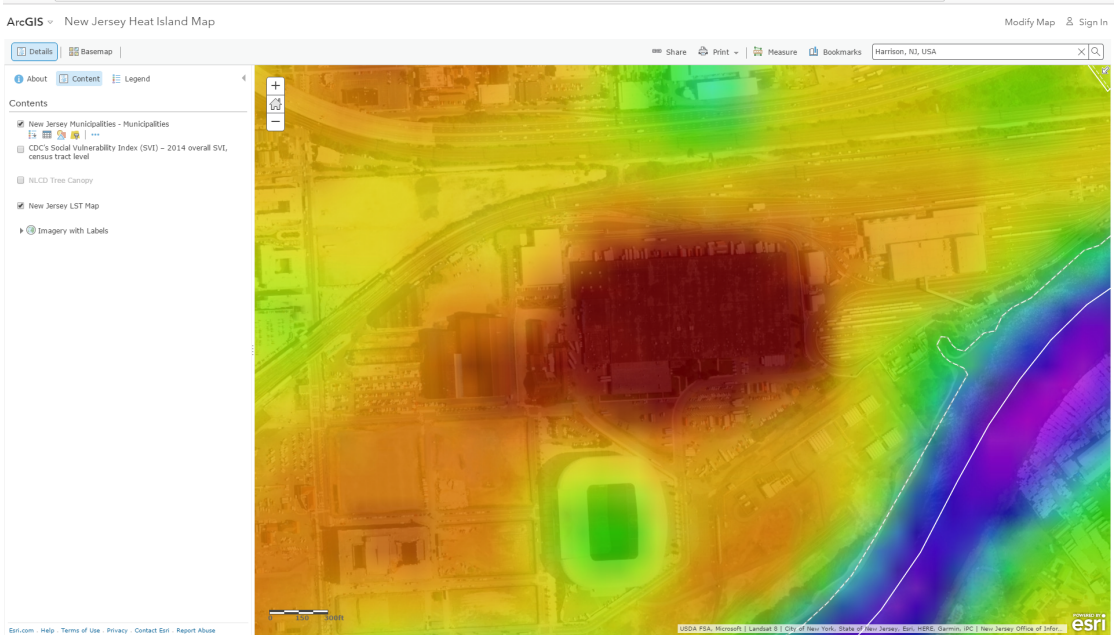


4. Map the tree canopy and social vulnerability using the respective layers in “Contents” sidebar. Take a screenshot of each map and drop it into the document.





5. Profile the hot spots. In the same document, list each of the hot spots and provide the name, address, and type (e.g. dark roof, parking lot, etc.). Also, indicate if the hot spot is in an area with few trees or socially vulnerable populations. Do this by comparing the location of the hot spots with the tree canopy and social vulnerability maps. Tips: If the location of the hot spot is not clear from the UHI map, use Google maps to match up the location.



B. Examples of Hot Spot Typologies

The following are descriptions of the typical hot spot typologies.

Dark Roofs - One of the most common types of hot spots are dark roofs, which absorbs more solar radiation than lighter color roofs, and generate heat. Note that it's not only very dark roofs that are a problem - even gray roofs can generate high levels of heat. While people aren't typically exposed to the surfaces of roofs, roofs can increase the indoor temperature of a building as well as the ambient temperature of the surrounding area.

Parking Lots / Large Areas of Asphalt - Other common hot spots include parking lots and large areas of asphalt such as school play areas. Many of these areas have very little vegetation for shade and evapotranspiration. While parking lots may not be as dark as black rooftops, the gray color can still absorb a substantial amount of solar radiation and create extreme heat. And unlike roofs, people come into direct contact with parking lots and other surfaces such as school asphalt play areas.

Minimal tree/vegetation cover. - In addition to parking lots, virtually any area with minimal tree cover or vegetation may come up as hot spots, such as streets, sidewalks and plazas. There also might be other sources of heat in these hot spots, including the reflectivity of road/pavements as well as building surfaces.

Synthetic Turf Fields - Despite the green color, synthetic turf fields actually absorb high amounts of solar energy due to their plastic makeup and can become extremely hot in the summer. This phenomenon has been known for many years[1], and was recently documented in the National Public Radio (NPR) article and radio segment: High Temps on Turf Fields Spark Safety Concerns. The NPR article mentions that fields can reach up to 160 degrees Fahrenheit, which can be quite hazardous to people and may also release toxic gasses.

C. Cooling Strategies for Urban Heat Islands

This section outlines a variety of improvements and strategies that can help minimize or eliminate the effects of urban heat islands, or hot spots, on individual properties and neighborhoods. Resources are provide to further explore the suitability of these cooling strategies. The cost of each of these improvements will vary according to the type of improvements, the suitability/characteristics of the property (e.g. is the roof of a building suitable for a cooling layer without major structural improvements?), and the maintenance requirements. However, in many cases, the initial investment in these cooling strategies are returned in lower utility bills and decreases in medical conditions related to extreme heat.

Converting dark roofs to cool roofs[2]– A cool roof is one that is designed to reflect more sunlight and absorb less heat than a traditional roof through the use of reflective materials or coatings (including

[1] http://plantscience.psu.edu/research/centers/ssrc/documents/temperature.pdf

[2] https://energy.gov/energysaver/cool-roofs

paint). Traditional (dark) roofing materials have a low solar reflectance of 5 to 15 percent, which means they absorb 85 to 95 percent of the energy reaching them instead of reflecting the energy back out to the atmosphere. Cool roofs can have a solar reflectance of more than 65 percent, decreasing the absorption of energy to 35% or less. Studies have shown that buildings with cool roofs can be almost ten degrees cooler than the dark roofs, which reduces both indoor and ambient air temperatures, reducing health risks and saving energy costs and consumption for indoor cooling.

Select resources:

See the Cool Roofs chapter in this report: "Adapting to Urban Heat: A Tool Kit for Local Governments," Georgetown Climate Center
http://www.georgetownclimate.org/reports/adaptation-tool-kit-urban-heat.html

See the Cool Roofs chapter in this report: "EPA's Heat Island Compendium"
https://www.epa.gov/heat-islands/heat-island-compendium

Greening roofs - Green roofs have a vegetative layer (e.g. shrubs, trees, ground cover and plants) on top of a waterproof membrane that can reduce temperatures of the roof surface and the ambient area through shade and evapotranspiration. Like cool roofs, green roofs can reduce the temperatures within a building, improving the comfort level during extreme heat, and reducing energy needs (and costs) for cooling. Since green roofs are not as reflective as cool roofs, they are not as effective at reducing temperatures. However, green roofs provide other co-benefits, including the aesthetic value of the plantings, and the potential for improving stormwater management through reduced runoff (increased absorption) and filtering of rainfall. Finally, while green roofs require more upfront costs than traditional roofs or cool roofs, the overall costs can be significantly less due to lower maintenance costs and increased longevity.

Select resources:

An Evaluation Study of Plants for Use on Green Roofs
https://www.chicagobotanic.org/downloads/planteval_notes/no38_greenroofplants.pdf

Selecting Plants for Extensive Green Roofs in the United States (E3047)
http://msue.anr.msu.edu/resources/selecting_plants_for_extensive_green_roofs_in_the_united_states_e3047

See the Green Roofs chapter in this report: "Adapting to Urban Heat: A Tool Kit for Local Governments," Georgetown Climate Center
http://www.georgetownclimate.org/reports/adaptation-tool-kit-urban-heat.html

See the Green Roofs chapter in this report: "EPA's Heat Island Compendium"
https://www.epa.gov/heat-islands/heat-island-compendium

Installing cooler pavement - While it would be difficult to completely remove all dark parking lots and asphalt in a community, certain areas can be retrofitted using cool pavements. Cool pavements are materials that reflect more solar energy than dark surface and enhance water evaporation, thereby storing and emitting less heat. Examples of cooling surfaces include concrete, sealing layers, permeable

pavement/pavers, and pavement with reflective aggregate. The suitability of a particular cooling pavement depends upon the intensity and frequency of traffic on the surface.

Select resources:

See the Cool Pavements chapter in this report: "Adapting to Urban Heat: A Tool Kit for Local Governments," Georgetown Climate Center
http://www.georgetownclimate.org/reports/adaptation-tool-kit-urban-heat.html

See the Cool Pavements chapter in this report: "EPA's Heat Island Compendium"
https://www.epa.gov/heat-islands/heat-island-compendium

Planting more street trees - Trees can notably reduce the UHI effect by shading surfaces and through the cooling effects of evapotranspiration. Understanding the types of trees and layout is important for gaining the most value from the trees. For example, large, dense clusters of trees are suitable for hotspots in large open spaces where they can significantly cool the area while also contributing to a park-like setting. Streetscapes typically have less room for tree clustering, but when trees are evenly spread out, the same number of trees have the benefit of providing shade to more buildings. Deciduous trees on the west side of buildings are most effective for cooling a building, especially if they shade windows and part of the building's roof. A deciduous tree is important in these locations because it won't shade a building during the winter months. There are many resources available that offer detailed guidance on how to bring shade and greenery to your community from choosing a tree, to where and when to plant, how to plant, and tree care and management. These are valuable in coming up with an effective tree planting strategy and action plan.

Select resources:

NJ Urban and Community Forest site of the New Jersey Forest Service
http://www.state.nj.us/dep/parksandforests/forest/community/index.html

Reducing Urban Heat Islands: Compendium of Strategies Trees and Vegetation (EPA)
https://www.epa.gov/sites/production/files/2014-06/documents/treesandvegcompendium.pdf

Using Trees and Vegetation to Reduce Heat Islands (EPA)
https://www.epa.gov/heat-islands/using-trees-and-vegetation-reduce-heat-islands

See the Urban Forestry chapter in this report: "Adapting to Urban Heat: A Tool Kit for Local Governments," Georgetown Climate Center
http://www.georgetownclimate.org/reports/adaptation-tool-kit-urban-heat.html

See the Trees and Vegetation chapter in this report: "EPA's Heat Island Compendium"
https://www.epa.gov/heat-islands/heat-island-compendium

Create green streets (and green infrastructure) - A green street is designed to manage stormwater through "green infrastructure". Green infrastructure within the street right-of-way allows the stormwater to filter into a vegetated bed of soil close to its source, and decreases the total amount of stormwater runoff into the streets and stormwater system, minimizing nuisance flooding, non-point

source pollution and water treatment costs for combined sewer overflow communities. Co-benefits of green streets include the aesthetics of the plantings, but also the shade and potential reduction in surface and ambient air temperatures from the vegetation and cooling surfaces. Given the multiple benefits of green streets, they should be considered as an important mitigation option for reducing heat islands. Green infrastructure also provides the same benefits when located in parking lots.

Select resources:

EPAs Green Infrastructure – Reduce Urban Heat Island effect
https://www.epa.gov/green-infrastructure/reduce-urban-heat-island-effect

Consider alternatives to existing synthetic turf fields and/or provide heat warnings or restrictions for existing fields - While synthetic turf fields are easier to maintain than natural grass, they may be hazardous during the summer months when people are more likely to use them. Communities should use natural grass for future field construction and consider removing existing synthetic turf fields when they wear out and need to be replaced. Until the synthetic turf has been removed and replaced, signs advising of heat warnings and restricted access should be placed around the fields. Planting shade trees adjacent to the playing fields for benches, resting and spectators as well as providing access to water during field events is also advisable.

Select resources:

Fact Sheets on Synthetic vs Grass Playing Fields
http://www.safehealthyplayingfields.org/fact-sheets

A Return to Roots – Detailing the comeback of natural grass at M&T Bank Stadium
http://www.turface.com/sites/default/files/_media/resource/mandt-stadiumcasestudy.pdf

Weatherization - refers to a collection of improvements that increase the energy efficiency of existing homes, lower utility bills, and create a more comfortable and healthy living environment. Examples of these improvements include installing or improving attic and wall insulation, sealing gaps around doors, windows, and in other areas with weather stripping and caulk, and replacing old, drafty windows and doors with energy-efficient models. While many of these improvements are aimed at retaining interior heat during the winter, they can also minimize the amount of outdoor heat from entering a building during the summer.

New Jersey's Clean Energy Program offers incentives for local government energy audits and efficiency upgrades, as well as incentives and rebates to encourage residents and businesses to review their current energy use and upgrade equipment and insulation to reduce overall energy consumption. Energy audits and energy efficiency upgrades address health, safety and comfort issues in buildings, offices, and homes, and call also save money on utility bills. Additional programs are available in New Jersey to assist low and moderate income households to increase energy efficiency at no cost to residents. New Jersey's Clean Energy Program offers the "Comfort Partners" program providing such assistance.

Select resources:

NJ Clean Energy Program http://njcleanenergy.com

Other General Resources

The following resources may also be helpful in completing this action.

General: Urban Heat Island Program, U.S. Environmental Protection Agency
https://www.epa.gov/heat-islands

"Adapting to Urban Heat: A Tool Kit for Local Governments," Georgetown Climate Center
http://www.georgetownclimate.org/reports/adaptation-tool-kit-urban-heat.html

"Heat Island Effect Reduction through Materials Usage & Design", Creating Sustainable Communities: A Guide for Developers and Communities, NJ Department of Environmental Protection
http://www.state.nj.us/dep/opsc/docs/Heat_Island.pdf

"Cool Policies for Cool Cities: Best Practices for Mitigating Urban Heat Islands in North American Cities," Global Cool Cities Alliance
http://aceee.org/sites/default/files/publications/researchreports/u1405.pdf

Mitigation of the heat island effect in urban New Jersey
http://www.sciencedirect.com/science/article/pii/S1464286705000045

ANJEC Report on UHI
www.anjec.org/pdfs/Fall2014ANJECReport-UrbanHeatIsland.pdf

Heat Island Group, Berkeley Lab
https://heatisland.lbl.gov/coolscience