

# Community-Scale Environmental Measures and Urban Heat Island Impacts

October 2011

## Fact Sheet

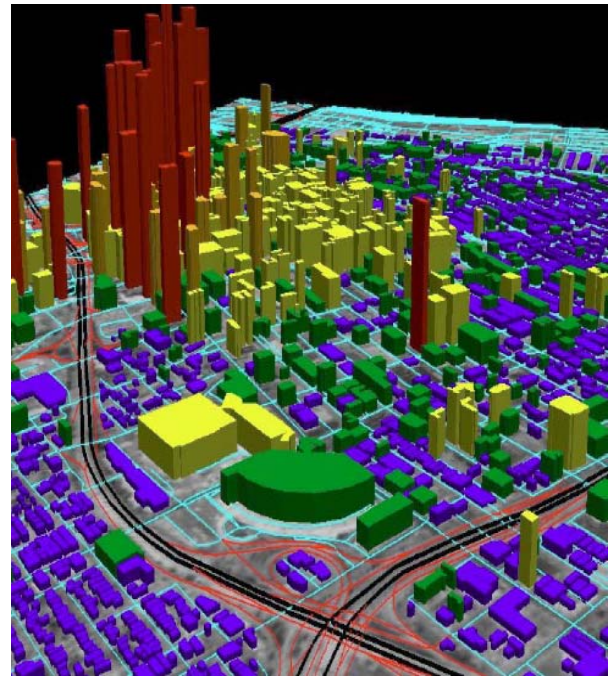
### The Issue

Community-scale environmental measures offer the potential to reduce energy use on a community-wide basis, but the impacts of the technologies, and the way they interact with each other, are not well quantified.

Community-scale environmental measures include solar collection technologies, such as photovoltaic arrays, solar thermal collectors, and passive solar designs, as well as measures to mitigate the urban heat island effect.

Urban heat islands are areas that are hotter than the surrounding countryside because of changes in the physical environment that result from development. Measures to mitigate this effect include the use of paving materials or other high albedo materials that reflect higher amounts of solar radiation, planting trees and other vegetation for shading and evapotranspirative cooling, installation of roofs with higher reflectivity (known as cool roofs), green roofs (permanent roof top landscape planting), and structural shading. All of these measures produce direct effects on building energy use, and indirect effects, by which the measure affects the outdoor environment, which in turn has an effect on a building's energy consumption.

The direct effects of individual measures have been evaluated, but little information exists on



Computer model of Los Angeles will be used to study Community Scale Environmental Measure effects  
Image source: Altostratus, Inc.

how to quantify the interactive effects of combining the measures, and how those interactions vary with climate. For example, while generating power, a photovoltaic system can also increase the surrounding air temperature and, if deployed on a wide scale, can increase the heat island effect, adding to the cooling loads of local buildings. Information on these types of interactions will help land-use planners prioritize the deployment of community-scale environmental measures.

## Project Description

This project will use advanced computer simulation techniques, including fine-resolution meteorological modeling, to predict the changes in ambient temperatures that result from the deployment of community-scale environmental measures. The simulations will look at individual technologies as well as the feedback loops and interactions that occur when technologies are deployed in combinations. The simulations will be carried out in two phases. In the first phase, idealized communities will be modeled and analyzed for 181 subclimate zones, covering all of the 16 climate zones in California defined by Title 24 Energy Code. In the second phase, three California cities will be modeled: Los Angeles, Sacramento, and Fresno.

The changes in ambient temperatures revealed by the simulations will form the basis for ranking the technologies and prioritizing their deployment. The lowest ambient temperatures correspond to the greatest indirect cooling energy savings.

## Anticipated Benefits for California

The objective of this project is to develop a better understanding of community scale environmental measures and how they interact. This information will help California communities make land-use planning decisions that minimize energy consumption on a community-wide basis.

## Project Specifics

Grant Agreement Number: PIR-08-030  
Recipient: Altostratus, Inc.  
City/County: Martinez/Solano County  
Application: Statewide  
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Term: June 2008 to March 2013

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