

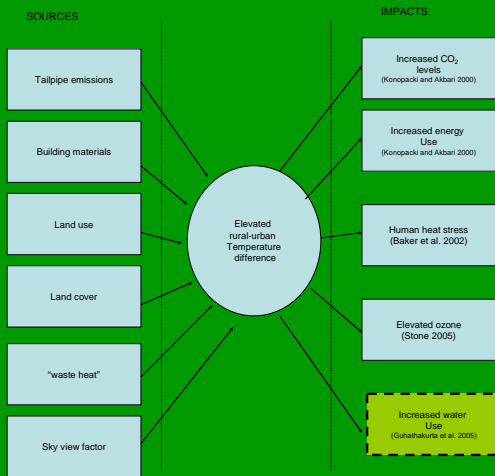


The Impact of Urban Heat Islands on Water Use: The Case of Phoenix Metropolitan Area

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Sources and Impacts of Heat Island Effects



ABSTRACT

The effect of heat islands in Phoenix has been an increase in summer nighttime temperatures of about 3.9° F while afternoon temperatures have risen 1.1° F (Balling and Brazel 1986a, 1986b, Brazel et al. 2000). Although microclimatic effects resulting from changes in land use and land cover have caused overall increases in temperatures in all months and all hours of the day, a spatial variation in changes in nighttime temperatures can be observed in localized areas. In this paper, we examine whether the spatial variation in summer nighttime temperatures as a result of urban heat island also impact the amount of household water use. In addition, we also analyze the temporal variation in metropolitan water use that can be attributed to changes in summer nighttime temperatures. A cross-sectional analysis of a detailed dataset of water use in June 1998 reveals a significant impact of rising nighttime temperatures on water use in Phoenix.

Empirical Results

The model reported explains 80 percent of the variation in mean single family water use by census tract

What Matters Most

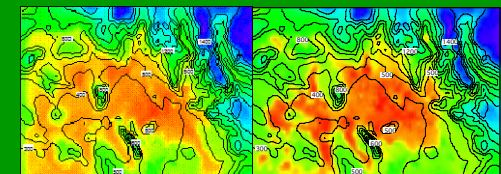
- Owner occupancy (-)
- Median household income in tract (-)
- Average size of unit in tract (+)
- Average size of pool in tract (+)
- Number of at least college educated persons (-)
- Average low temperature in tract (+)
- Amount of vegetation / mean SAVI index (+)

What doesn't seem to matter

- Age of inhabitants
- Mean age of units
- Land value

How should we grow?

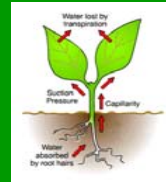
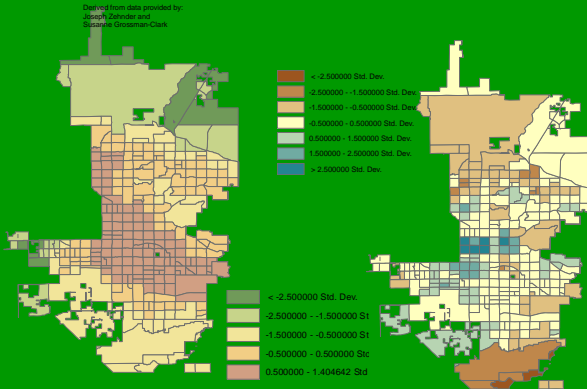
Contemplating Phoenix urban futures



(Grossman-Clarke and Zehnder 2005)

Mean Nighttime Temperatures in June 8, 1998 at 5:00AM

Mean Water Consumption by Single Family Units in June 1998

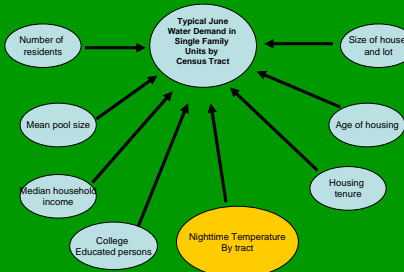


Increased Transpiration (1)



Increased Evaporation (2)

The Model:
What would explain the variation in water demand?



According to our current results, if the average nighttime temperature of 70 °F increased by 1 °F, the increase in water demand in a typical household (using 16000 gallons) would be 448 gallons for the month *ceteris paribus*

Acknowledgment

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