

In Partial Fulfillment of the Requirements for the Degree of

Doctor of Philosophy
Wen-Ching Chuang

Will defend her dissertation

**Vulnerability to Heat Stress in Urban Areas: A Sustainability
Perspective**

Extreme hot-weather events have become life-threatening natural phenomena in many cities around the world, and the health impacts of excessive heat are expected to increase with climate change (Huang et al., 2011; Knowlton et al., 2007; Meehl & Tebaldi, 2004; Patz, 2005). Heat waves will likely have the worst health impacts in urban areas, where large numbers of vulnerable people reside and where local-scale urban heat island effects (UHI) retard and reduce nighttime cooling.

This dissertation presents three empirical case studies that were conducted to advance our understanding of human vulnerability to heat in coupled human-natural systems. Using vulnerability theory as a framework, I analyzed how various social and environmental components of a system interact to exacerbate or mitigate heat impacts on human health, with the goal of contributing to the conceptualization of human vulnerability to heat. The studies: 1) compared the relationship between temperature and health outcomes in Chicago and Phoenix; 2) compared a map derived from a theoretical generic index of vulnerability to heat with a map derived from actual heat-related hospitalizations in Phoenix; and 3) used geospatial information on health data at two areal units to identify the hot spots for two heat health outcomes in Phoenix. The results show a 10-degree Celsius difference in the threshold temperatures at which heat-stress calls in Phoenix and Chicago are likely to increase drastically, and that Chicago is likely to be more sensitive to climate change than Phoenix. I also found that heat-vulnerability indices are sensitive to scale, measurement, and context, and that cities will need to incorporate place-based factors to increase the usefulness of vulnerability indices and mapping to decision making. Finally, I found that identification of geographical hot-spot of heat-related illness depends on the type of data used, scale of measurement, and normalization procedures. I recommend using multiple datasets and different approaches to spatial analysis to overcome this limitation and help decision makers develop effective intervention strategies.

Wednesday, November 20, 2013
8:30AM
Brickyard Orchid House (DCDC), Suite 126B, room 175

Faculty, students, and the general public are invited.

Supervisory Committee:
Patricia Gober, Chair
Christopher Boone, Member
Subhrajit Guhathakurta, Member
Darren Ruddell, Member