



In Partial Fulfillment of the Requirements for the Degree of

Doctor of Philosophy
Yuliya Dzyuban

Will defend her dissertation

**Exploring the Relationship between Design and Outdoor Thermal
Comfort in Hot and Dry Climate**

Abstract

Moderate physical activity, such as walking and biking, positively affects physical and mental health. Outdoor thermal comfort is an important prerequisite for incentivizing active lifestyle. Thus, extreme heat poses significant challenges for people who are outdoors by choice or necessity. Type and qualities of built infrastructure determines the intensity and duration of individual exposure to heat. As cities globally are shifting priorities towards non-motorized and public transit travel, more residents are expected to experience the city on their feet. Thus, physical conditions as well as psychological perception of the environment that affect thermal comfort will become paramount. Phoenix, Arizona, is used as a case study to examine the effectiveness of current public transit and street infrastructure to reduce heat exposure and affect thermal comfort of walkers and public transit users. The City of Phoenix has committed to public transit improvements in the Transportation 2050 plan and has recently adopted Complete Streets Policy. Proposed changes include mobility improvements and creating a safe and comfortable environment for non-motorized road participants. To understand what kind of improvements would benefit thermal comfort the most, it is necessary to understand heat exposure at the finer spatial scales, explore whether current bus-shelter designs are adequate in mitigating heat-health effects, and comprehensively assess the impact of design on physical, psychological and behavioral aspects of thermal comfort. A study conducted at bus stops in one Phoenix neighborhood examined grey and green infrastructure types preferred for cooling and found relationships between perception of pleasantness and thermals sensation votes. Walking interviews conducted in another neighborhood during the Heat Mappers event examined the applicability of the framework for walking behavior under the stress of heat, and how differences between the streets affected perceptions of the

walkers. Findings revealed that many of the structural themes from the framework of walking behavior applied in the study, however, participants assessed majority of the elements from the effectiveness to mitigate heat. Finally, the framework of walkability in hot and arid climates was developed based on the literature review and results from the empirical studies. This dissertation contributes to filling the gap between walkability and outdoor thermal comfort, and presents methodology and findings that can be useful to address walkability and outdoor thermal comfort in the hot cities of the Global South, and cities in temperate climates that may face similar climate challenges in the future due to global warming.

Tuesday, November 5, 2019
10:00 am
Wrigley Hall, Room 323

Faculty, students, and the public are invited.

Supervisory Committee:
Dr. Charles Redman, Chair
Dr. Paul Coseo,
Dr. David Hondula