

The Role of Urban Development Patterns for Mitigating Extreme Urban Heat: The Case Study of Doha, Qatar

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Abstract : Mitigating extreme urban heat is challenging in a desert climate such as Doha, Qatar, since outdoor daytime temperature area often too high for the human body to tolerate. Recent studies demonstrate that cities in arid and semiarid areas can exhibit 'urban cool islands' - urban areas that are cooler than the surrounding desert. However, the variation of temperatures as a result of the time of day and factors leading to temperature change remain at the question. To address these questions, we examined the spatial and temporal variation of air temperature in Doha, Qatar by conducting multiple vehicle-base local temperature observations. We also employed three statistical approaches to model surface temperatures using relevant predictors: (1) Ordinary Least Squares, (2) Regression Tree Analysis and (3) Random Forest for three time periods. Although the most important determinant factors varied by day and time, distance to the coast was the significant determinant at midday. A 70%/30% holdout method was used to create a testing dataset to validate the results through Pearson's correlation coefficient. The Pearson's analysis suggests that the Random Forest model more accurately predicts the surface temperatures than the other methods. We conclude with recommendations about the types of development patterns that show the greatest potential for reducing extreme heat in air climates.

Keywords : desert cities, tree-structure regression model, urban cool Island, vehicle temperature traverse

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