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Economic Assessment of Heat in the Phoenix Metro Area

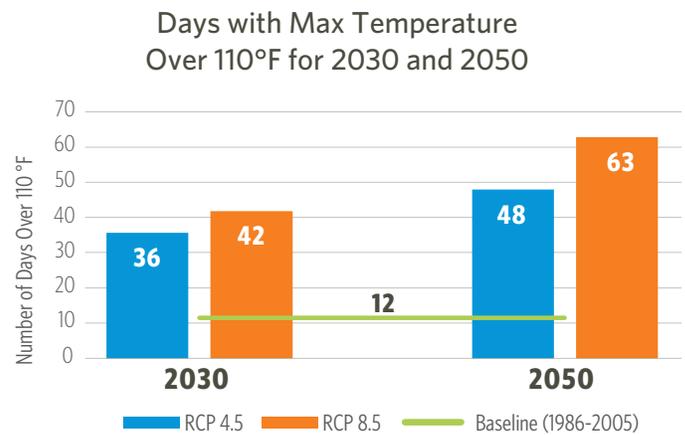
Background

Extreme heat is impacting residents and businesses in the Phoenix Metropolitan Area. With a changing climate and a growing and aging population, it is anticipated that the magnitude of these impacts will only increase in the future. The goal of this study is to estimate the economic consequences to the Phoenix Metro Area from failing to take action against extreme heat and to evaluate the costs and benefits of solutions designed to address these consequences.

A climate conditions analysis was completed to understand how temperatures may change for two future timeframes (2030, 2050) and emissions scenarios¹ relative to a baseline climate² (1986-2005). Baseline and future costs of heat on five indicators of human and economic well-being were evaluated: mortality, morbidity, labor productivity, roadway infrastructure, and critical services with a focus on energy demand. The analysis first estimated the costs of inaction of these five indicators and then the avoided losses that would be realized from investing in solutions. These avoided losses were then compared to the costs of solutions in a benefit-cost analysis.

Conditions Analysis

Overall, the number of days over 110°F in 2030 and 2050 was estimated to be nearly three to five times the number of days over this threshold under baseline conditions.



Notes: Results are shown as the mean of the results of ten GCMs for two emissions scenarios (RCP 4.5 and RCP 8.5). Results for 2030 represent annual averages for 2020-2039. Results for 2050 represent annual averages for 2040-2059. Baseline represents 1986-2005. A global climate model (GCM) is a complex mathematical representation of the major climate system components (atmosphere, land surface, ocean, and sea ice), and their interactions. For more information, please see: [HYPERLINK "https://protect-us.mimecast.com/s/9YbQCDkZxRlyV48nIWZNP7?domain=gfdl.noaa.gov"](https://protect-us.mimecast.com/s/9YbQCDkZxRlyV48nIWZNP7?domain=gfdl.noaa.gov) <https://www.gfdl.noaa.gov/climate-modeling/>

¹ The two future emissions scenarios were based on Representative Concentration Pathways (RCPs) recognized by the Intergovernmental Panel on Climate Change (IPCC): RCP 4.5, a medium stabilization scenario in which emissions are reduced and RCP 8.5, a high-emissions scenario

² Baseline climate is used to determine what the climate is under normal conditions, or a typical year, as based on the period 1986-2005"

The Cost of Inaction

- Under 2050 conditions, rising temperatures could result in an additional \$1.5 billion in average annual heat-related mortality costs under a high-emissions scenario relative to 1986-2005 conditions.
- Annual pavement maintenance needs currently cost Phoenix Metro Area transportation agencies over \$100 million. By 2050, average annual maintenance needs could increase costs by 4%.
- Salt River Project estimates, based on current context, that a 1°F increase in temperature during the months of May through October could increase average summer residential bills by \$64, or \$10 per month.
- Under 2050 conditions, labor productivity losses from high heat are anticipated to result in an average annual 0.4% loss in Gross Regional Product under a high-emissions scenario relative to 1986-2005 conditions.

Average Annual Economic Consequences of Inaction, 2020-2059

Indicator	Emissions Scenario RCP 4.5	Emissions Scenario RCP 8.5
Mortality	\$898M	\$1.2B
Morbidity	\$4M	\$5M
Labor Productivity	\$855M	\$964M
Roadway Infrastructure	\$4M	\$4M
Energy Demand	\$116M	\$116M
Total	\$1.9B	\$2.3B

Notes: Shown in \$2021 as average annual consequences from 2020-2059 for RCP 4.5 and RCP 8.5 using mean of 10 GCMs. No financial discounting applied. Figures are rounded.

Solutions

Two solution scenarios were selected for their importance and viability in the region to be evaluated using benefit-cost analysis: implementing cool roofs throughout the Phoenix Metro Area and expanding the urban tree canopy. It was found that adoption of cool roofs in 100% of buildings in the Phoenix Metro Area by 2050 and increasing urban tree canopy cover to 25% by 2050 result in a positive benefit-cost ratio. In other words, the benefits these solutions offer related to mitigating heat impacts outweigh the costs to implement these solutions. For 100% cool roof implementation, the benefit-cost ratio was found to be 5.24. For 25% urban tree canopy, the benefit-cost ratio was found to be 3.78. Importantly, the benefits quantified in this analysis are limited to the five indicators included in the cost of inaction, and do not include other potential benefits that these solutions may offer – such as aesthetic benefits, air quality improvements, greenhouse gas emissions reductions, or reduced stormwater runoff.

Benefit-Cost Analysis Results for Solution Scenarios Analyzed

Solution Scenarios	Benefits	Costs	Benefit-Cost Ratio
100% Cool Roofs	\$7.9B	\$1.5B	5.24
25% Urban Tree Canopy	\$15.3B	\$4.0B	3.78

Notes: Shown in \$2021 over the period of analysis (2020-2059) with a 5% discount rate. Figures are rounded. Dollars are presented in 2021 dollar figures.

Conclusion

This study finds that not taking action to defend against heat in the Phoenix Metro Area may result in significant economic consequences. Furthermore, for the selected solution scenarios, the benefits are estimated to outweigh the costs. As Phoenix continues to urbanize and its population expands, the benefits of adapting to extreme heat may only increase, as will the consequences of inaction. To implement the ambitious solution scenarios and realize the associated benefits, both the public and private sector will need to play an active role. Collective action is critical towards ensuring that the Phoenix Metro Area not only continues to be an attractive place to live and do business, but that it supports a resilient economy and way of life that allows all communities to thrive.

ADVISORY COMMITTEE



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