City of Kent, WA

Plan Integration for Resilience Scorecard™ (PIRS™) for Heat

Spatially evaluating networks of plans to mitigate heat

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Recommended Citation: Keith, Ladd; Meerow, Sara; Trego, Shaylynn; Schmidt, Erika; Jensen, Lauren; Berke, Philip; and DeAngelis, Joseph. (2022). *City of Kent, WA: Plan Integration for Resilience Scorecard™ (PIRS™) For Heat*. Available from: https://www.planning.org/knowledgebase/urbanheat/

Acknowledgments: This material was supported by the U.S. NOAA Climate Program Office's Extreme Heat Risk Initiative, Cooperative Agreement NA21OAR4310148. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. NOAA.

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Executive Summary

The combination of climate change and the urban heat island (UHI) effect is increasing the number of dangerously hot days and the need for all communities to plan for urban heat resilience equitably. Urban heat resilience requires an integrated planning approach that coordinates strategies across community plans and uses the best available heat risk information to prioritize heat mitigation strategies for the most vulnerable communities. The Plan Integration for Resilience Scorecard™ (PIRS™) for Heat is an approach that communities can use to analyze how heat mitigation policies are integrated into different plans and to identify opportunities to better target heat mitigation policies in high heat risk areas. The PIRS™ for Heat was developed as an extension of the original Plan Integration for Resilience Scorecard™, a methodology originally developed by Berke et al. (2015) and then further advanced and translated to planning practice by Malecha et al. (2019), for spatially evaluating networks of plans to reduce vulnerability to hazards. With support from the U.S. National Oceanic and Atmospheric Administration (NOAA) Climate Program Office's Extreme Heat Risk Initiative and in partnership with the American Planning Association, PIRS™ for Heat was initially piloted in five geographically diverse U.S. communities, including Baltimore, MD, Boston, MA, Fort Lauderdale, FL, Seattle, WA, and Houston, TX. The rationale, methodology, and findings from the first five cities are published in the guidebook *The Plan Integration for Resilience Scorecard™ (PIRS™) for Heat: Spatially evaluating networks of plans to mitigate heat*. The approach was then applied to a sixth community, the City of Kent, WA. This report summarizes the PIRS™ for Heat results for Kent.

Adapting the process detailed in Malecha et al. (2019), the project team analyzed all policies in each community's network of plans, including their comprehensive plans, hazard mitigation plans, climate action plans, and climate change adaptation, resilience, or sustainability plans. Policies were only included if they had the potential to impact urban heat, were place-specific and contained a recognizable policy tool. Policies were then scored based on whether they would likely mitigate heat ("+1"), worsen heat ("-1"), or the impact was unclear from the description in the plan ("Unknown"). Scored policies were mapped to relevant census tracts across the communities to evaluate their spatial distribution and the net effect on urban heat. The resulting PIRS™ for Heat scorecard was then compared with physical and social vulnerability data to assess policy alignment with heat risks and to identify opportunities for improved urban heat resilience planning.

PIRS™ for Heat: City of Kent, WA

The City of Kent, Washington, has a population of 130,038 in 2020. Located in the Pacific Northwest region of the U.S., Kent's average daily maximum temperature is currently 55.7°F (13.2°C), with an average of no days over 100°F (37.8°C). Under high emissions scenarios, the average daily maximum temperature would increase to 63.8 °F (17.7°C) by 2100, with 2.7 days over 100°F (37.8°C).

Methodology

This application of the PIRS™ for Heat follows the steps outlined in the guidebook (Keith et al. 2022). This includes the creation of the scorecard by assembling the network of plans, identifying, categorizing, and scoring policies in those plans, and then mapping them. These results are analyzed by comparing them with data on physical and social vulnerability, leading to recommendations for future heat mitigation planning.

Plans and Policies

Table 1 summarizes the four Kent plans assessed using the PIRS™ for Heat approach. Across the four Kent plans, we identified 219 heat-relevant policies that met the criteria for inclusion.

Table 1. Plan detail summary

Plan Name	Year Adopted	Scale	Plan Category	Number of policies
City of Kent Comprehensive Plan	2015	City	Comprehensive	88
King County Regional Hazard Mitigation Plan; City of Kent Plan Annex	2020	City	Hazard	1
City of Kent Parks & Open Space Plan	2022	City	Parks	62
Transportation Master Plan	2021	City	Transportation	68

We coded the 219 policies into five of the eight categories of land use policy tools (Table 2). The majority of the policies were categorized as capital improvements (166 policies), followed by development regulations (35), and land use analysis and permitting process (10). Zero heat-related policies were identified that used density transfer provisions, public facilities, and post disaster reconstruction decisions.

Table 2. Land use policy tool categories

Policy Tool Category	Number of Policies
Land Use Analysis and Permitting Process	10
Capital Improvements	166
Development Regulations	35
Land Acquisition	5
Density Transfer Provisions	0
Financial Incentives and Penalties	1
Public Facilities	0
Post Disaster Reconstruction Decisions	0

We also coded the 219 policies into all four heat mitigation strategy categories (Table 3). The most common categories of heat mitigation strategies were waste heat (106 policies) and land use (59 policies). Together these accounted for the majority of policies. We found 50 policies focused on mitigating heat through urban greening, and only three were categorized as urban design. Note that some policies were associated with more than one heat mitigation strategy category/subcategory, so individual heat mitigation strategy category totals add up to more than the 219 policies identified.

Table 3. Heat mitigation strategy categories

Heat Mitigation Strategy Category	Number of Policies
Land use	59
Urban design	3
Urban greening	50
Waste heat	106

Scorecard

Out of the 219 policies we coded, 143 policies were found to decrease heat in the built environment (receiving a score of +1), zero policies were found to increase heat in the built environment (receiving a score of –1), and zero policies were found to have a neutral heat impact in the built environment (receiving a score of 0). There were 76 policies classified as having an unknown impact on heat.

Only the policies that received a score of +1 or -1 were mapped; the policies with an unknown impact on heat were excluded from the scorecard map.

Figure 1 shows the PIRS™ for Heat net scores (the sum of all the applicable +1 and -1 policies) for each census tract. Net scores ranged from 26 to 69 across the city. While there is spatial variation in scores, the highest scoring tracts tend to be in the southern area of the city.

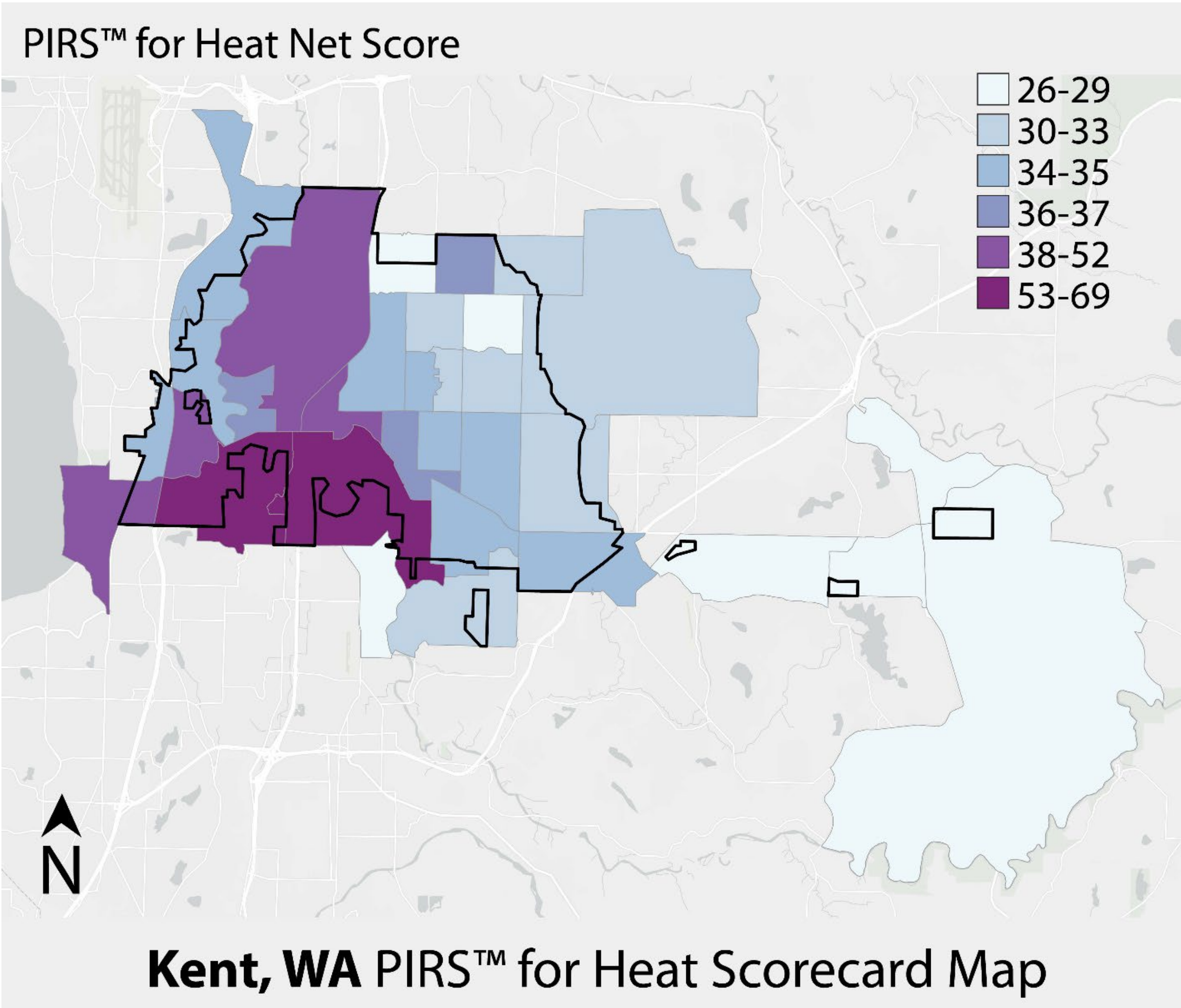

Figure 1. Kent PIRS™ for Heat net scores by census tract.

Analysis

Figure 2 shows Kent's PIRS™ for Heat net score, mean afternoon temperature from the National Integrated Heat Health Information Network (NIHHIS) urban heat island (UHI) map campaign, and CDC Social Vulnerability Index (SVI) ranking by 2020 census tract. We calculated the Pearson correlation coefficient to determine if there was a statistically significant relationship between tract net scores and vulnerability indicators. We found a positive correlation coefficient between the PIRS™ for Heat net score and mean afternoon temperature (0.050), but it was not statistically significant. The lack of statistical significance could be, in part, the result of the small sample size, but this finding also suggests that heat mitigation policies are not systematically targeting the hottest areas of the city.

The correlation coefficient (0.494) between PIRS™ for Heat net scores and social vulnerability is also positive, and in this case, it is statistically significant ($p<0.01$). This suggests that more socially vulnerable areas of the city are targeted with more heat mitigation policies. We did not find a statistically significant correlation (coefficient: 181, p-value: 0.323) between social vulnerability and mean afternoon temperature, indicating that more socially vulnerable areas may not necessarily be the same areas that experience the hottest afternoon temperatures.

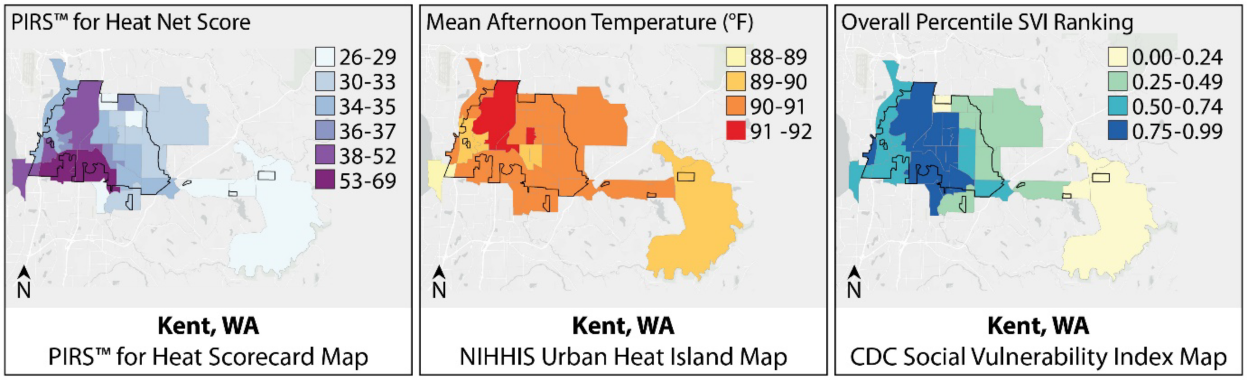

Figure 2. Kent's PIRS™ for Heat net score by census tract (left), mean afternoon temperature by census tract (middle), and CDC SVI ranking by census tract (right).

Additionally, while no policies were identified that would increase vulnerability to heat in Kent, 76 relevant policies were coded as having an unknown impact on heat. It would be beneficial for the city to review these policies and add additional information on potential heat impacts or heat mitigation measures. Kent may also want to consider the impact of policies on heat in the development of future plans.

Going forward, Kent can utilize the results from the PIRS™ for Heat analysis, as well as documented heat risk and social vulnerability data to prioritize the most vulnerable areas of the city for policies that increase resilience to the impacts of heat and decrease heat in the built environment.

References

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