

2025 Brighton Residential Heat Risk Report



**Brighton
Council**

Introduction

As climate change drives rising temperatures and more frequent heatwaves, understanding urban heat risk is crucial for protecting communities. This report presents an analysis of residential heat risk in Brighton, focusing on how different suburbs experience heat exposure and social vulnerability.

Using geospatial data, we developed four key indices ranging from 1 to 10:

- **Heat Susceptibility Index** – Identifies areas that tend to get the hottest, based on satellite-derived land surface temperatures.
- **Heat Exposure Index** – Measures the level of heat surrounding residential buildings, reflecting local temperature conditions.

- **Social Vulnerability Index** – Assesses community sensitivity to heat, considering demographics such as age and socioeconomic status.
- **Residential Heat Risk Index** – Combines exposure and vulnerability to highlight areas where residents face the greatest risk during extreme heat events.

The findings highlight urban suburbs most at risk, with Brighton, Bridgewater, and Pontville showing the highest concentration of residential buildings classified as high heat risk (Index 7, 8, 9 and 10). This analysis aims to support heat mitigation strategies, such as increasing urban greenery, improving building materials, and planning for climate resilience.

Data and Methodology Summary

Data:

This analysis is based on a combination of satellite imagery, census data, and spatial datasets provided by different sources.

NAME	SOURCES AND DESCRIPTION
Landsat 8/9 Thermal Imagery (2019–2024)	Used to calculate summer land surface temperatures (LST)
Residential Buildings	Extracted from The LIST building footprint layer (2025)
Suburb and LGA Boundaries	From The LIST locality and government area datasets
Census Data (ABS 2021)	Used to calculate population vulnerability and socioeconomic disadvantage at SA1 level

Table 1: Summary of Data Sources and Descriptions Used in the Brighton Residential Heat Risk Assessment. This table lists the key datasets used in the analysis, including satellite imagery, building footprints, census data, and spatial boundaries. Each dataset is described with its source, acquisition date, and role in generating the heat risk indices.

Methodology:

Heat Susceptibility Index

- Calculated from multiple Landsat images using median summer land surface temperature (LST) values per pixel.
- Pixel values were classified into ten percentile-based intervals representing relative surface temperature, with cutoff percentiles of [0, 40, 50, 60, 70, 80, 90, 92.5, 95, 97.5, 100].

Heat Exposure Index

- Calculated by averaging heat susceptibility within a 400m buffer (~5 min walk) around each residential building.

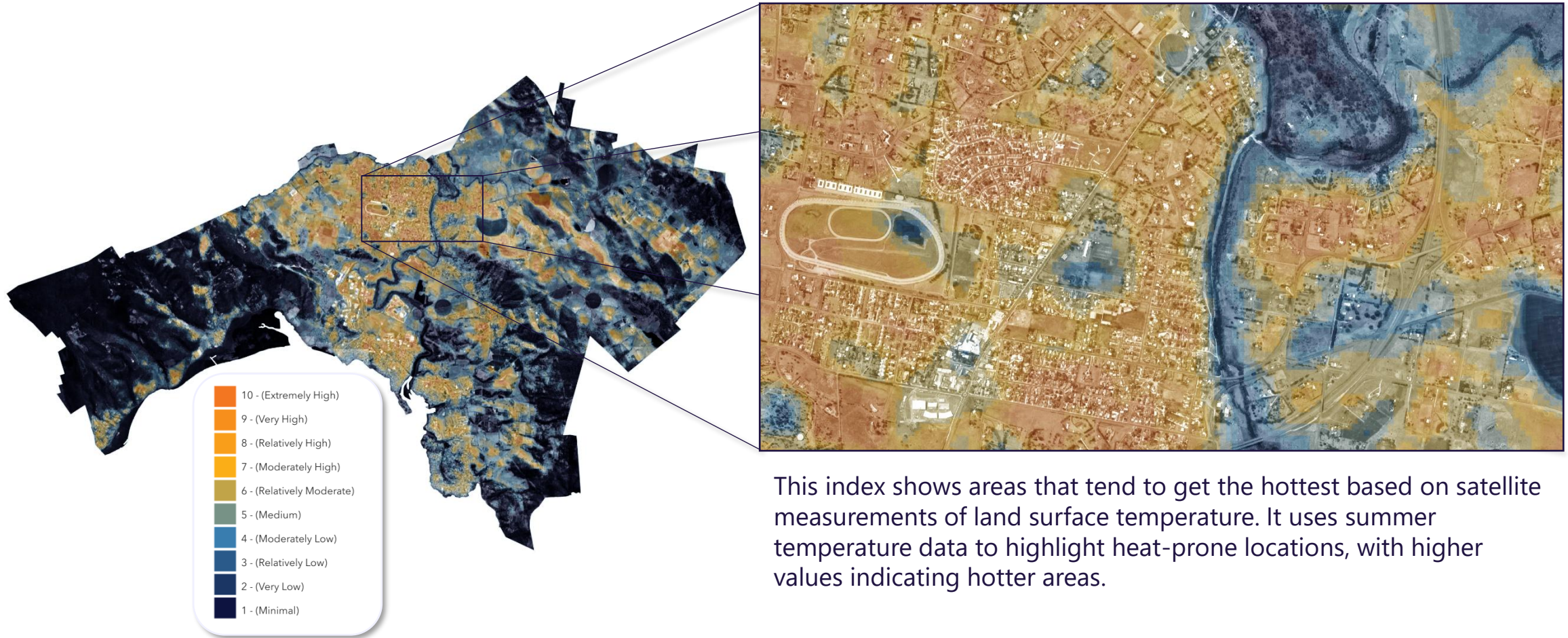
Social Vulnerability Index

- Combines the proportion of vulnerable age groups and socioeconomic disadvantage (IRSAD) per SA1 area.
- Final index ranges from 1 (minimal vulnerability) to 10 (extremely high vulnerability).

Residential Heat Risk Index

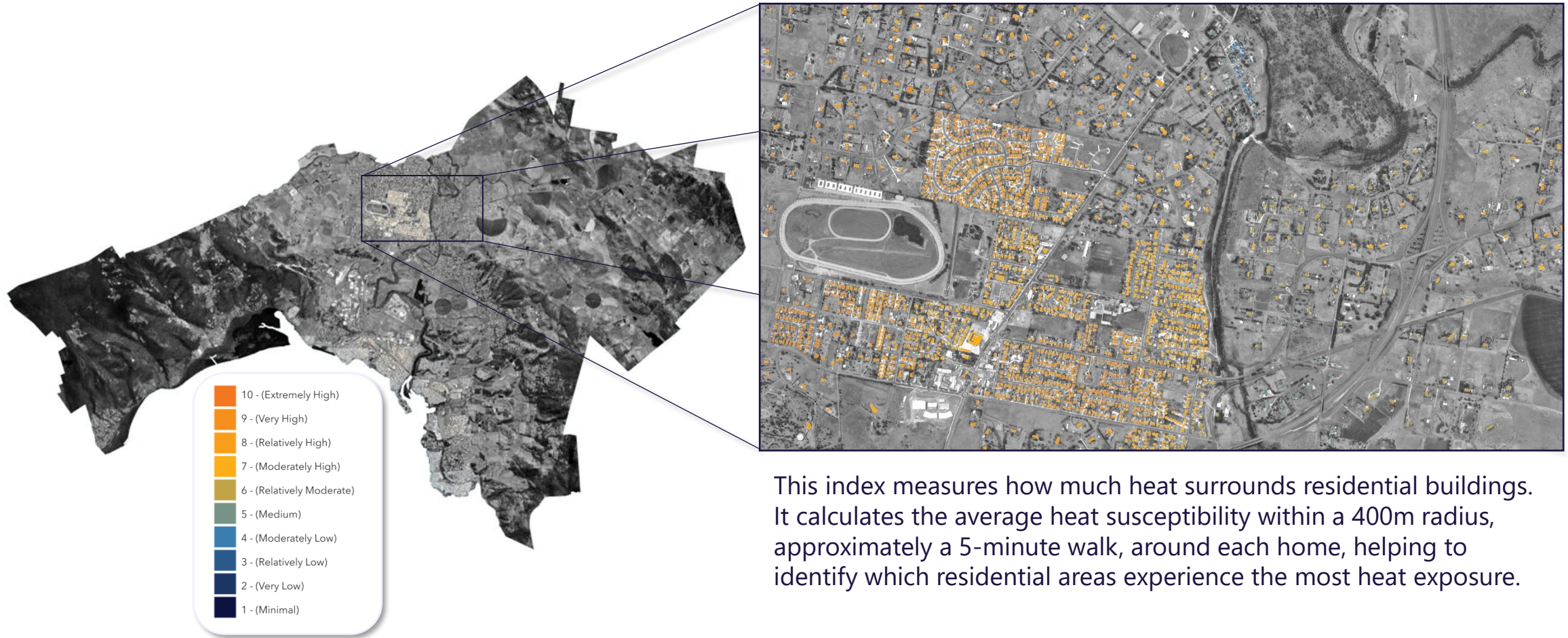
- Combines exposure and vulnerability to identify residential buildings at highest risk.
- Index values range from 1 to 10, with 7 - 10 indicating high risk.

Heat Susceptibility Index



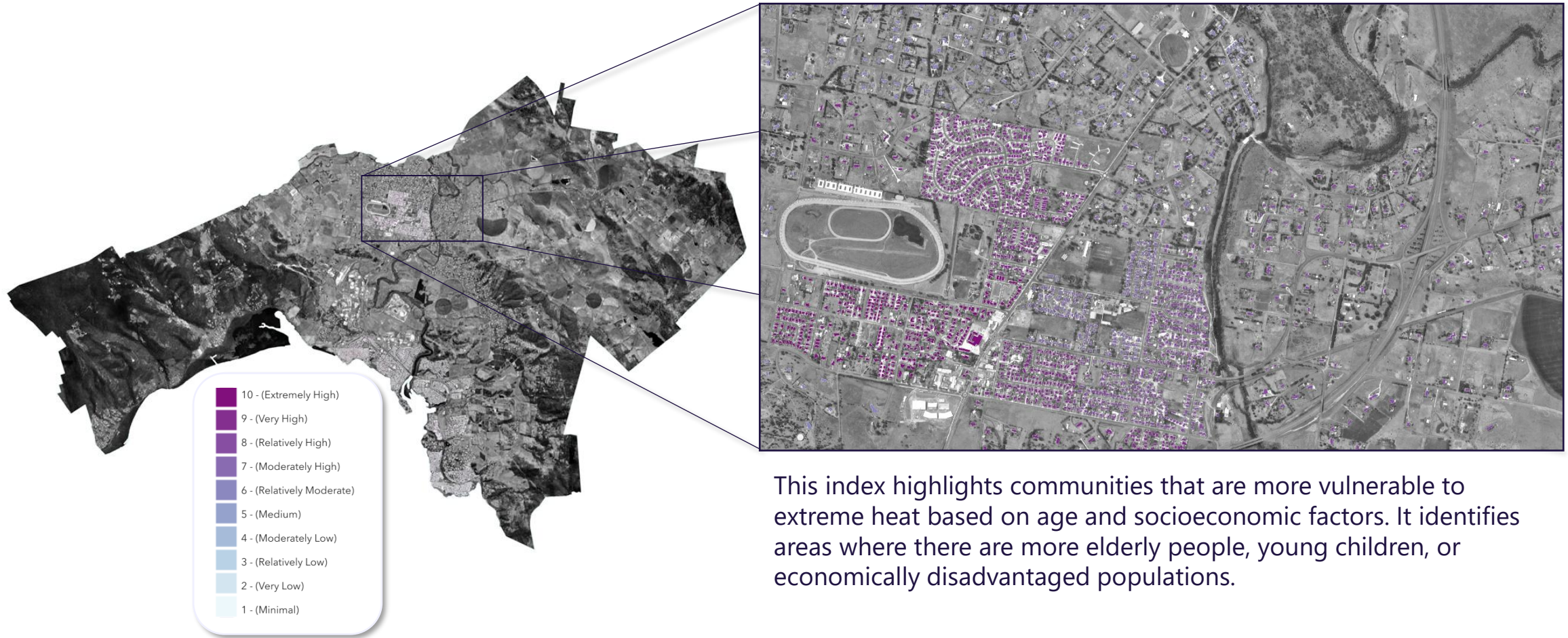
This index shows areas that tend to get the hottest based on satellite measurements of land surface temperature. It uses summer temperature data to highlight heat-prone locations, with higher values indicating hotter areas.

Heat Exposure Index

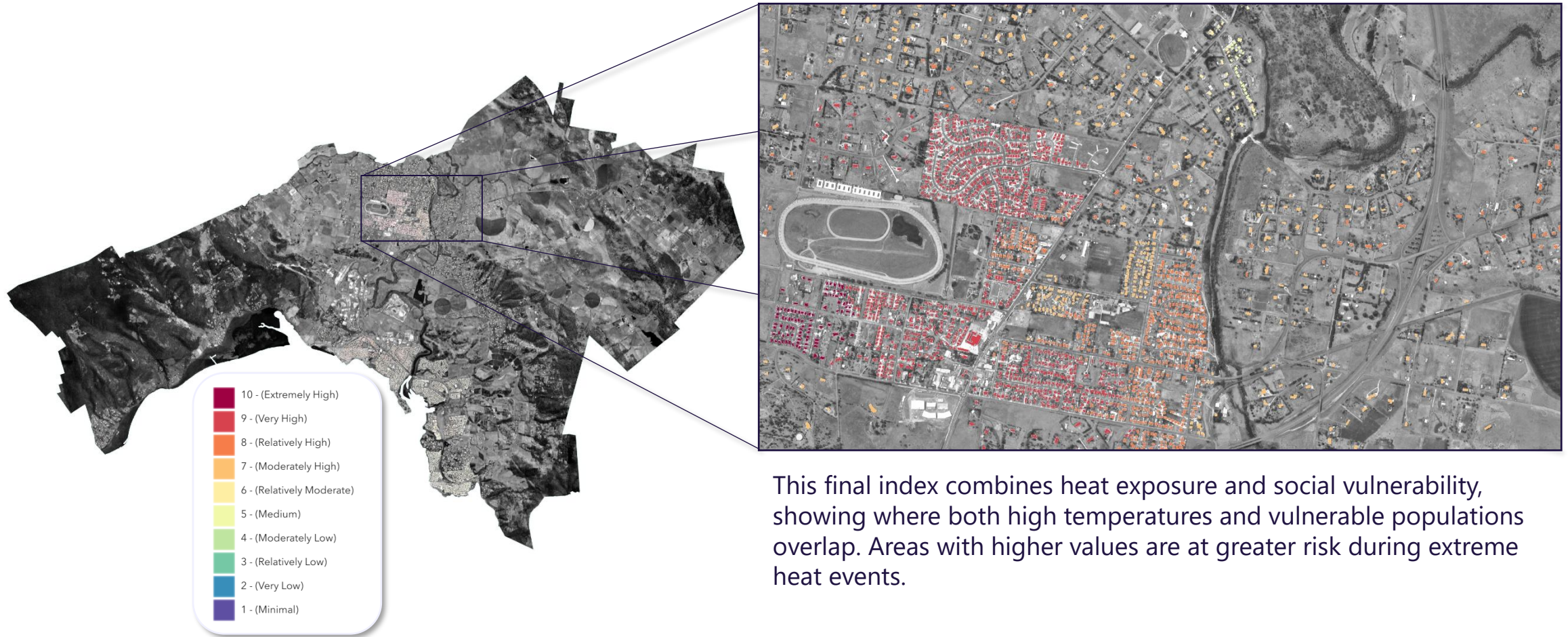


This index measures how much heat surrounds residential buildings. It calculates the average heat susceptibility within a 400m radius, approximately a 5-minute walk, around each home, helping to identify which residential areas experience the most heat exposure.

Social Vulnerability Index



Residential Heat Risk Index



This final index combines heat exposure and social vulnerability, showing where both high temperatures and vulnerable populations overlap. Areas with higher values are at greater risk during extreme heat events.

Heat Exposure, Social Vulnerability and Heat Risk: Distribution of Residential Buildings

Table 2: Distribution of Residential Buildings in the Highest Heat Exposure, Social Vulnerability and Heat Risk Categories (Index 7, 8, 9, and 10). This table presents the number and percentage of residential buildings, classified by Heat Exposure, Social Vulnerability and Residential Heat Risk Indices. The data focuses only on the four highest risk categories (7, 8, 9, and 10), highlighting variations in extreme heat exposure, vulnerability and risk. '% of Total Buildings' represents the proportion of residential buildings within each category relative to all 7,775 residential buildings in the Brighton LGA.

Index	Heat Exposure		Social Vulnerability		Residential Heat Risk	
	Number of Buildings	% of Total Buildings	Number of Buildings	% of Total Buildings	Number of Buildings	% of Total Buildings
10 - Extremely High	0	0.00%	571	7.34%	96	1.23%
9 - Very High	287	3.69%	1130	14.53%	882	11.34%
8 - Relatively High	1068	13.74%	1417	18.23%	1386	17.83%
7 - Moderately High	1150	14.79%	1924	24.75%	1408	18.11%
Total	2,505	32.22%	5,042	64.85%	3,772	48.51%

The results highlight the considerable number and proportion of buildings experiencing high to extreme levels of heat exposure, social vulnerability, and residential heat risk. However, most of these buildings do not fall within the highest index category across indicators.

As per definition, ~10% of the LGA area is classified as having moderately high or greater heat susceptibility, yet over 32% of buildings fall within equivalent high-exposure categories. This indicates that these buildings are primarily concentrated in smaller, dense urban areas where heat accumulates more intensely.

Built-up environments experience elevated surface temperatures due to materials such as asphalt and concrete retaining heat, limited vegetation cover, and higher levels of human activity, whereas natural landscapes and vegetation help regulate local temperatures more effectively.

As climate change progresses and urban areas expand, a growing number of buildings are expected to experience high heat exposure. Consequently, implementing heat mitigation strategies will be essential to reduce future heat exposure and enhance urban resilience.

Distribution of High-Exposure, -Vulnerability and -Risk Residential Buildings by Suburb

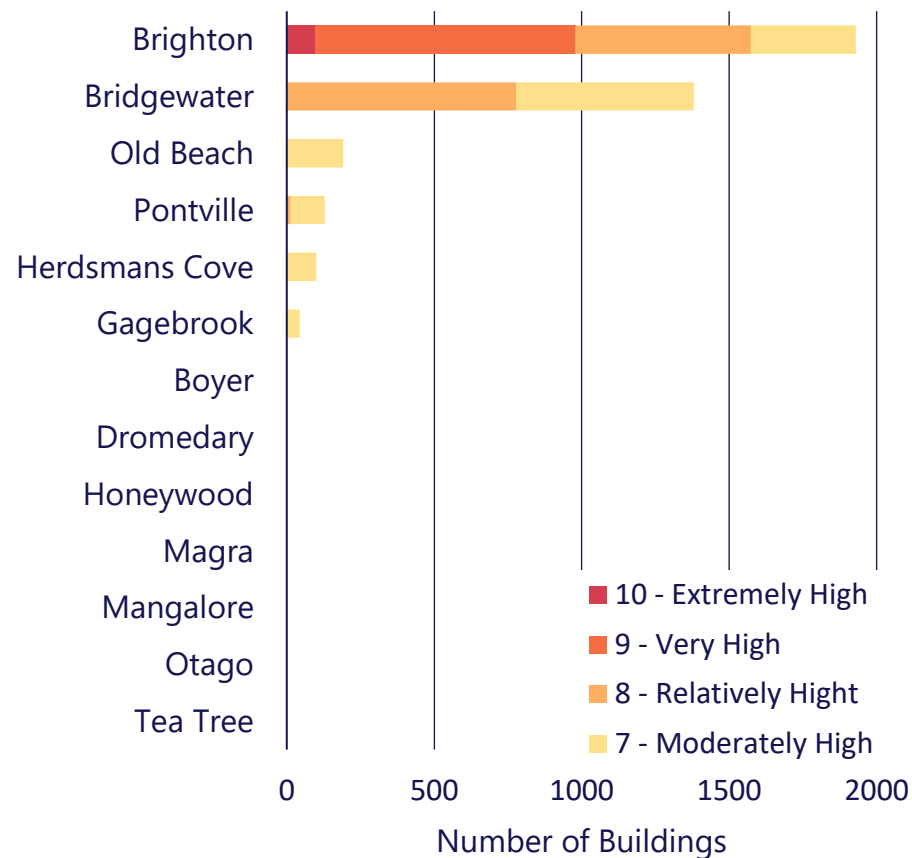
Suburb	Heat Exposure		Social Vulnerability		Residential Heat Risk	
	Number of Buildings	% of Buildings in Suburb	Number of Buildings	% of Buildings in Suburb	Number of Buildings	% of Buildings in Suburb
Brighton	1762	87.36%	1881	93.26%	1929	95.64%
Bridgewater	502	26.87%	1640	87.79%	1380	73.88%
Old Beach	0	0.00%	1352	72.26%	191	10.21%
Pontville	128	61.24%	1	0.48%	128	61.24%
Herdsmans Cove	100	16.78%	0	0.00%	100	16.78%
Gagebrook	0	0.00%	167	26.01%	44	6.85%
Boyer	0	0.00%	0	0.00%	0	0.00%
Dromedary	0	0.00%	0	0.00%	0	0.00%
Honeywood	7	3.95%	1	0.56%	0	0.00%
Magra	0	0.00%	0	0.00%	0	0.00%
Mangalore	0	0.00%	0	0.00%	0	0.00%
Otago	0	0.00%	0	0.00%	0	0.00%
Tea Tree	6	4.48%	0	0.00%	0	0.00%
Total	2,505		5,042		3,772	

Key Findings:

- Heat risk is predominantly an urban issue. 48.5% of all buildings have high to extreme heat risk, while most (>87%) of these buildings are located in the urban centres of Brighton and Bridgewater. 61-95% of buildings in Brighton, Bridgewater and Pontville are at high heat risk.
- Similarly to the distribution of high heat risk suburbs, heat exposure and social vulnerability are concentrated in Brighton and Bridgewater. Old Beach is another social vulnerability hot spot that is, however, not affected by high heat exposure.
- Suburbs such as Gagebrook, Boyer, Dromedary, Magra, Mangalore and Otago have no buildings in the highest exposure categories, suggesting that these areas experience less extreme heat exposure and have factors mitigating heat risk, such as vegetation cover.

Table 3: Distribution of Residential Buildings in the highest Heat Exposure, Social Vulnerability and Heat Risk Categories (Index 7, 8, 9, and 10) by Suburb. This table presents the number and percentage of residential buildings in each suburb classified within the highest index categories. '% of Buildings in Suburb' represents the proportion of residential buildings within each suburb relative to the total number of residential buildings in that suburb.

Suburbs at Highest Heat Risk: Residential Buildings in Index 7, 8, 9 & 10



Key Findings:

- Brighton (1,762 buildings), Bridgewater (1,380 buildings), are the most at-risk suburbs, with the highest number of buildings in the extreme to high heat risk categories.
- Old Beach, Pontville, Herdsmans Cove and Gagebrook also show significant numbers of Moderately High-risk buildings, though at a lower scale.
- 96 buildings in Brighton were classified as Heat Risk Index 10, underlining the significance of heat risk in this suburb.
- The urban heat island effect plays a significant role in these results, as heat-retaining surfaces and limited tree cover contribute to increased risk.
- The results highlight which suburbs may require heat mitigation efforts, such as increasing tree canopy, improving building materials, and enhancing cooling infrastructure to reduce heat exposure in residential areas.

Figure 1: Number of Residential Buildings Divided by Suburb Classified as High Heat Risk (Index 7, 8, 9, 10). This graph presents the number of residential buildings classified in four high heat risk categories (Index 7, 8, 9, 10).

Limitations & Assumptions

- **Satellite Timing:** Landsat captures imagery at ~10–11am, so results reflect morning temperature patterns.
- **Topography Effects:** East-facing slopes may appear warmer due to earlier sunlight; terrain influences local temperature estimates. This effect is most noticeable in steep terrain, which is mostly vegetated and sparsely inhabited.
- **Reflective Surfaces:** White or reflective roofs may appear cooler in thermal imagery due to lower emissivity.
- **Imagery Quality:** Image availability and quality are influenced by cloud cover and other atmospheric conditions. Only cloud free imagery is included in this study.
- **Building Classification:** Only clearly identifiable residential buildings were included. A small number of ambiguous buildings may have been excluded.

Conclusion

The results of this analysis reinforce the urban heat island effect, where dense, built-up areas experience higher temperatures than more sparsely inhabited suburbs. More than 87% of all buildings at high heat risk (index category 7, 8, 9 and 10) are located in Brighton and Bridgewater.

Key takeaways include:

- High-risk suburbs such as Brighton, Bridgewater and Pontville should be prioritised for heat adaptation measures.
- Special priority should be granted to the area surrounding the 96 buildings at Extremely High heat risk in Brighton.
- Green infrastructure, reflective surfaces, and urban planning can help mitigate heat retention and

improve thermal comfort in high-risk areas.

As climate risks continue to grow, proactive strategies will be essential to minimise heat-related health impacts and enhance urban resilience. This report provides a data-driven foundation for policymakers, urban planners, and community stakeholders to implement effective heat mitigation solutions.



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