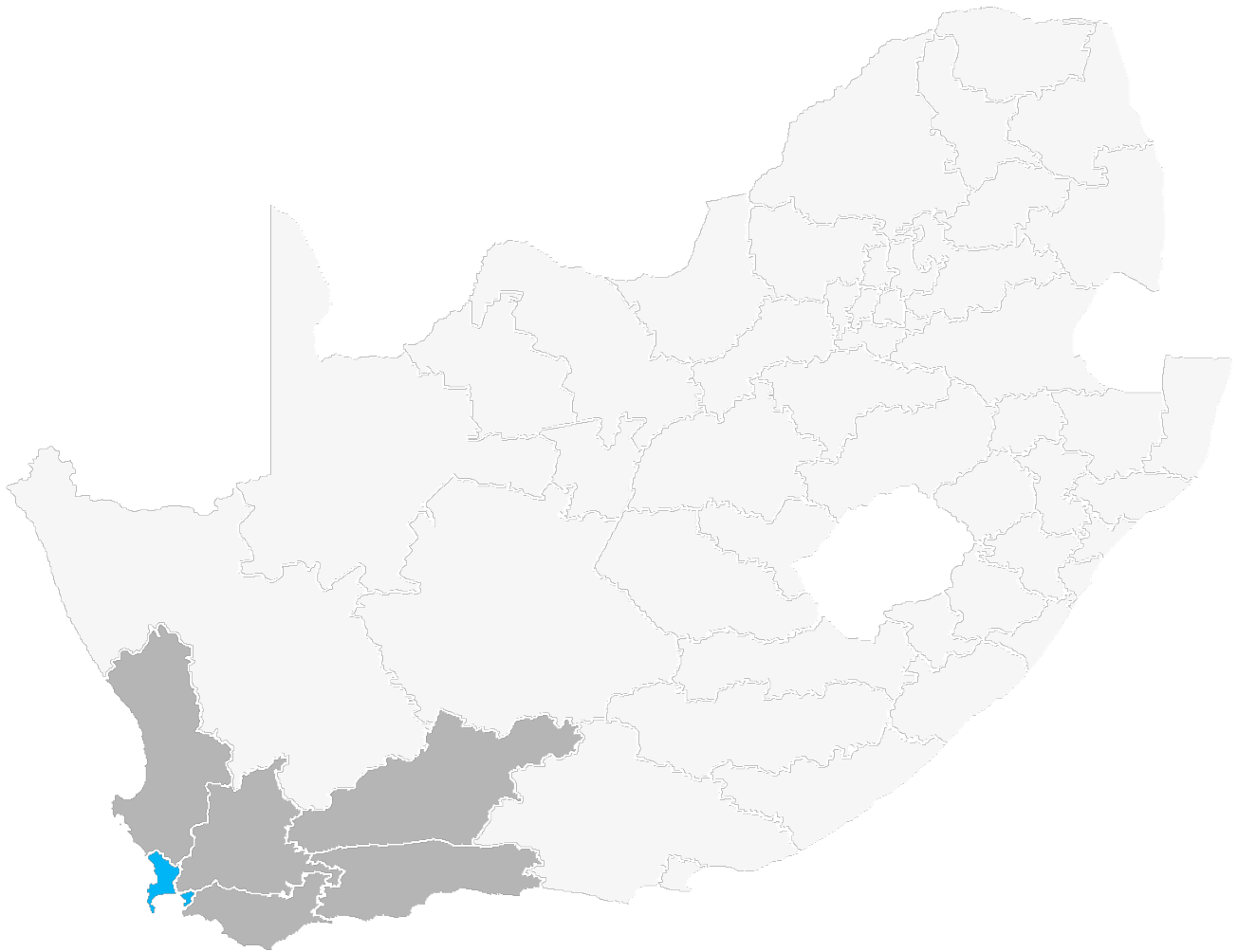


Cape Town, South Africa (33.9253° S, 18.4239° E)

A comprehensive climatic analysis report for a mixed-use building

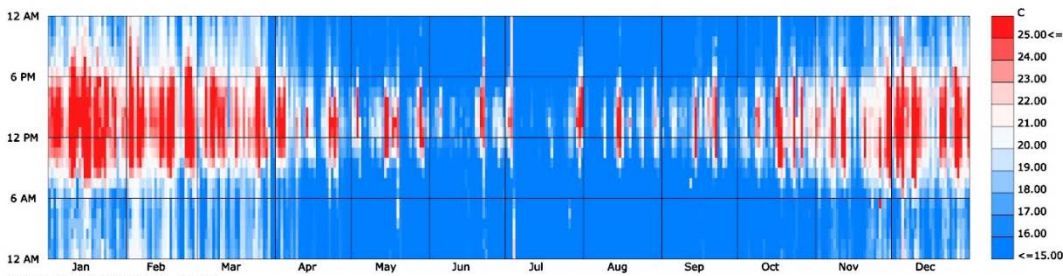


Contents:

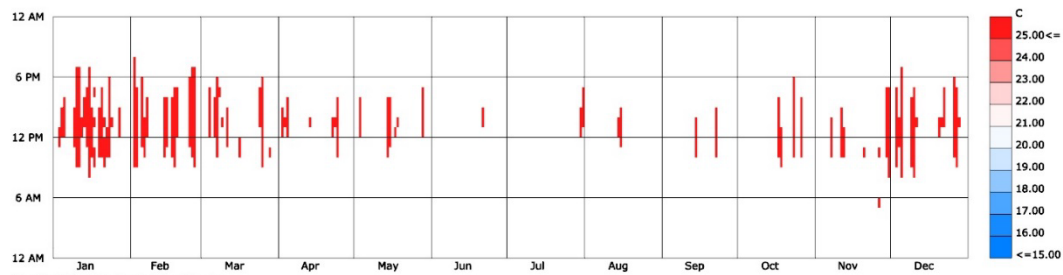
1. Temperature
2. Relative humidity
3. Wind speed and directions
4. Sun-path
5. Building orientation
6. Courtyard proportion
7. Psychrometric analysis
8. Summary
9. Step forward

Temperature

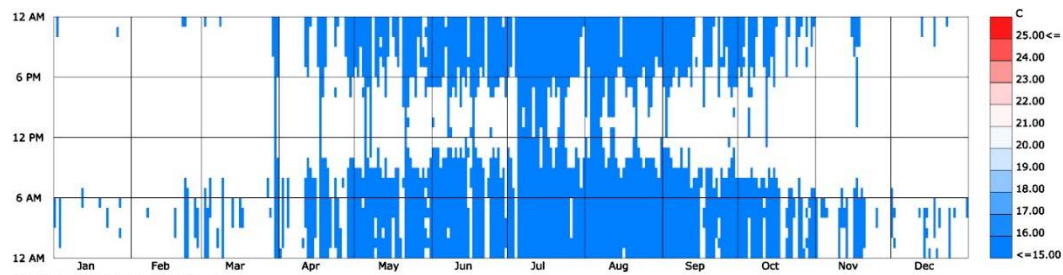
Cape Town is located at 33.93° South latitude, about 10.4° South of the tropic of Capricorn and experiences mildly cold to warm Mediterranean climate.



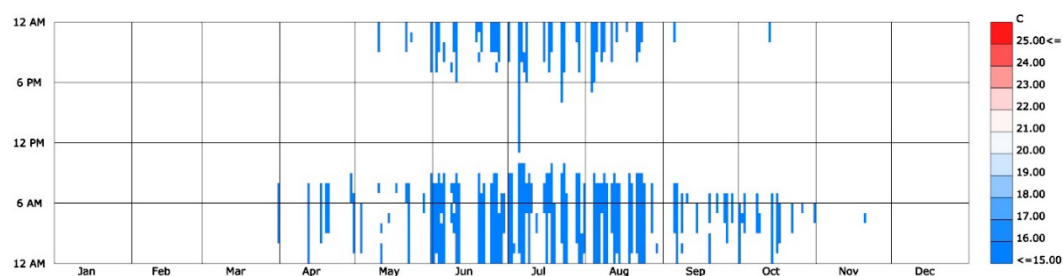
(Fig 1.1) The annual temperature graph of Cape Town indicating the average annual temperature range



(Fig 1.2) Graph indicating the times of the year when the temperature falls higher than comfortable (25°)*



(Fig 1.3) Graph indicating the times of the year when the temperature falls lower than comfortable (15°)*



(Fig 1.4) Graph indicating the times of the year when the temperature falls below 10°

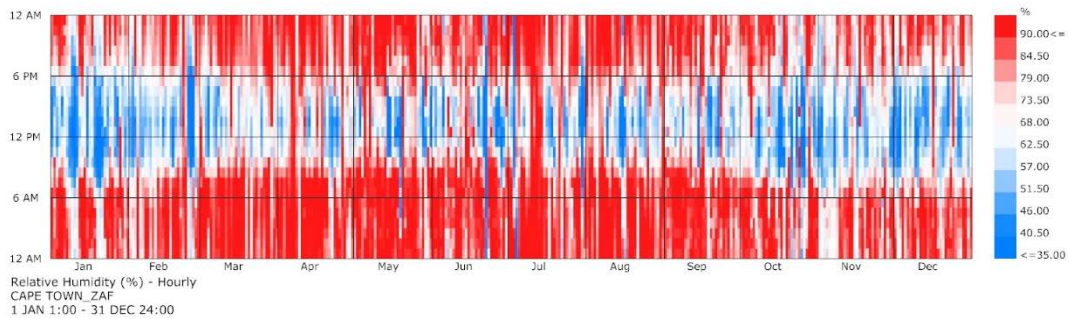
Observations:

- Based on the graphs, the temperature of Cape Town remains outside the comfort zone for much of the year.
- The temperature range is wide, from -4.3° to 42.4°⁽¹⁾ but leans towards the colder side for a greater part of the year therefore heat gain during the colder months is required.

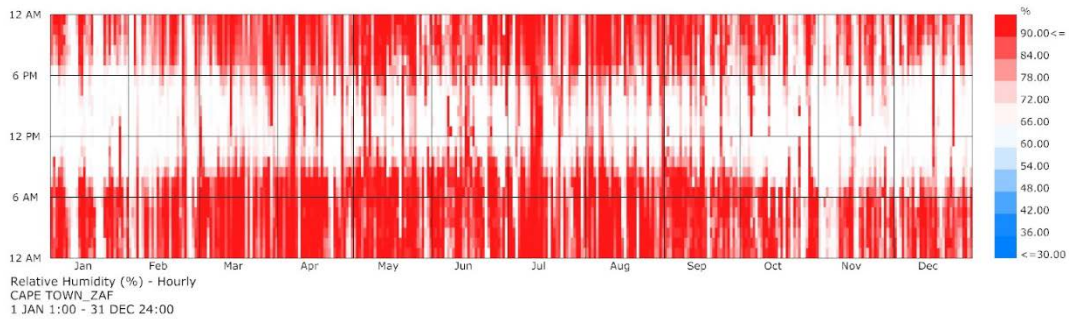
*Comfort range considered between 15°-25°C
⁽¹⁾World meteorological organization

Relative humidity

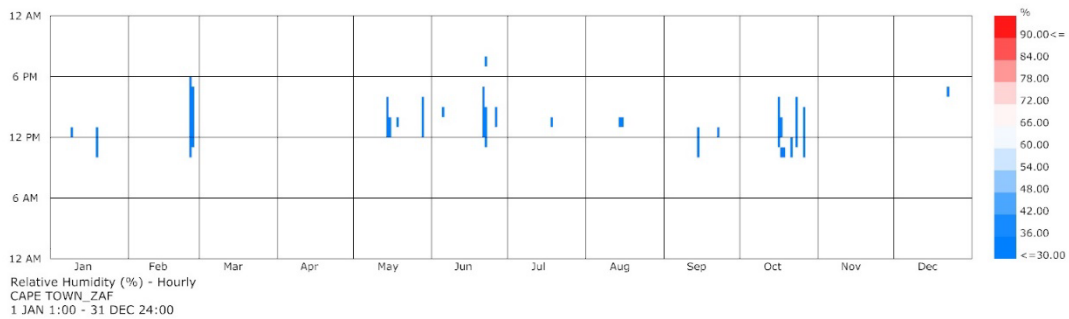
Cape Town is located on the coast and experiences a high amount of relative humidity throughout the year.



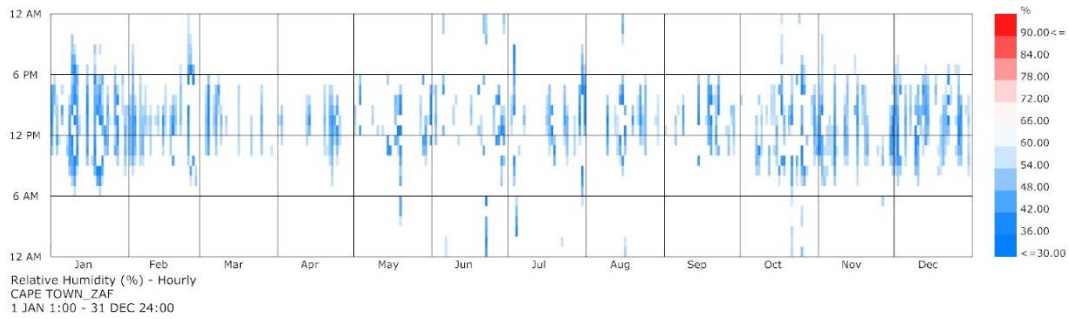
(Fig 2.1) The annual relative humidity graph of Cape Town indicating the average relative humidity range



(Fig 2.2) Relative humidity graph of Cape Town indicating the relative humidity higher than 60%



(Fig 2.3) Relative humidity graph of Cape Town indicating the relative humidity lower than 25%



(Fig 2.4) Relative humidity graph of Cape Town indicating the relative humidity within the range of comfort*

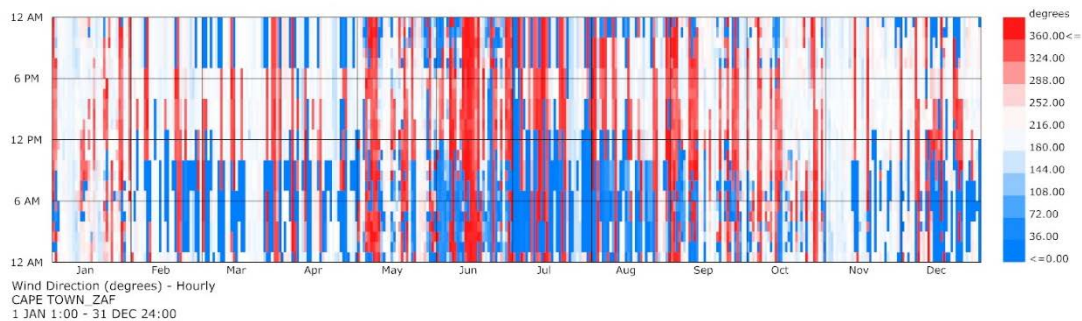
Observations:

- Based on the graphs, the relative humidity of Cape Town is higher than optimum for the most part of the year.
- Dehumidification using ventilation is required.

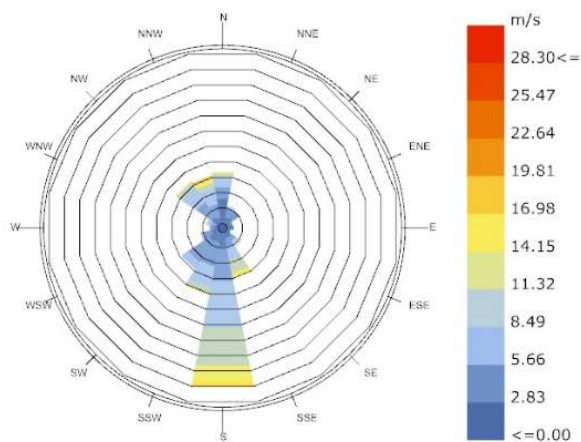
*Comfort range considered between 35%-55%

Wind speeds and directions

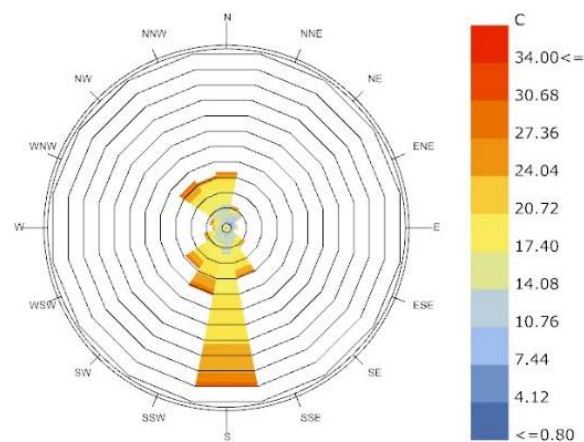
Being a coastal town, Cape Town experiences strong sea breezes.



(Fig 4.1) The annual wind directions in Cape Town



Wind-Rose
CAPE TOWN_ZAF
1 JAN 1:00 - 31 DEC 24:00
Hourly Data: Wind Speed (m/s)
Calm for 10.64% of the time = 932 hours.
Each closed polyline shows frequency of 2.3%. = 203 hours.



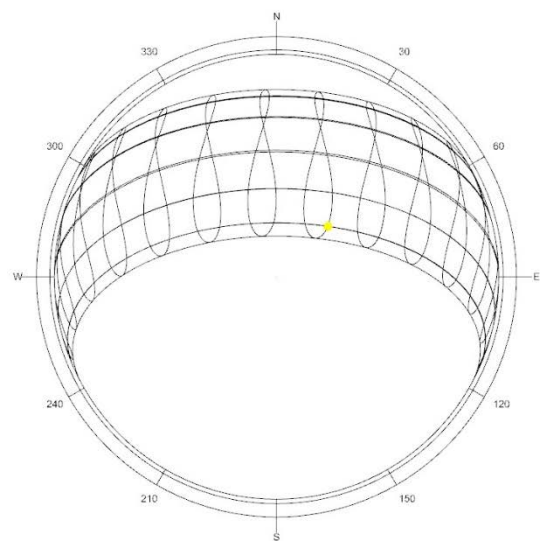
Wind-Rose
CAPE TOWN_ZAF
1 JAN 1:00 - 31 DEC 24:00
Hourly Data: Dry Bulb Temperature (C)
Calm for 10.64% of the time = 932 hours.
Each closed polyline shows frequency of 2.3%. = 203 hours.

(Fig 4.2) The average wind speeds with directions and temperatures

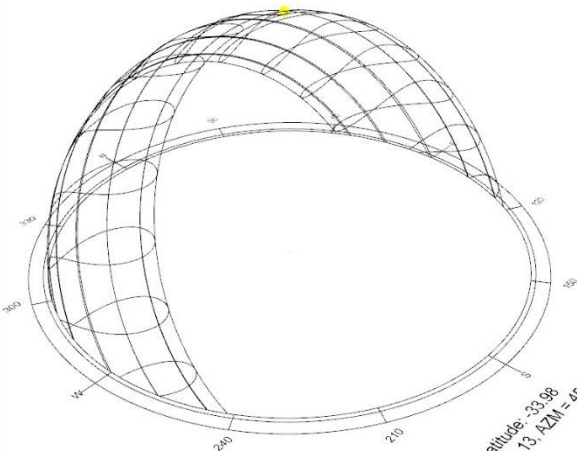
Observations:

- The wind speeds vary and often go beyond 12 m/s or drop below 2.5 m/s
- Most winds blow from the due south. The stronger winds tend to be higher in temperature.

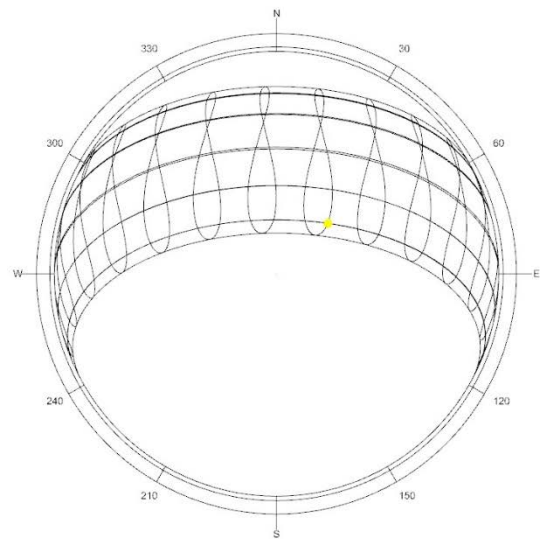
Sun Path



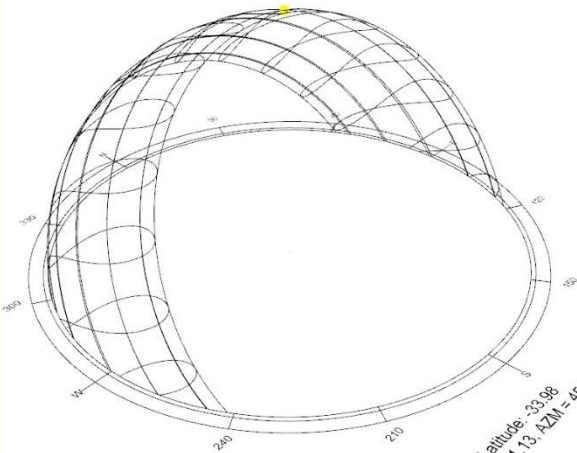
Sun-Path Diagram - Latitude: -33.98
21 JAN 12:00, ALT = 71.13, AZM = 45.48



Sun-Path Diagram - Latitude: -33.98
21 JAN 12:00, ALT = 71.13, AZM = 45.48



Sun-Path Diagram - Latitude: -33.98
21 JAN 12:00, ALT = 71.13, AZM = 45.48



Sun-Path Diagram - Latitude: -33.98
21 JAN 12:00, ALT = 71.13, AZM = 45.48

Based on the analysis so far, the following suggestions could truly help improve the building performance:

- Some glazing in North and West will help solar heat gain during the cold months.
- Cross ventilation and ventilation through stack effect using courtyards will help cool and dehumidify the building.
- Facing the windows South to induce ventilation and using evaporative cooling measures to cool the warm breezes along the wind path.
- Openable louvers instead of windows to induce ventilation would help control wind speed.

For a more detailed report on design suggestions, the following data is required:

- The total built-up area of the development;
- The site location and orientation;
- Context data (Surrounding buildings, building heights, etc.)

The Future:

- Due to Global warming, the mean annual temperature of Cape Town might increase. Provisions of evaporative cooling (water fountains on site, etc.) might be a good option to cool the building if the temperature further rises.