

## **Effect of Weather Factors on Thermal Comfort among Residents in Commercial Center in Shah Alam, Selangor**

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### **Structured Abstract**

**Background:** Thermal comfort is the perception of a stress-free, comfortable thermal environment, which is influenced by societal standards and varies with location and season. It is felt through skin sensations, body temperature, and thermoregulation efforts, which occur when body temperature is steady, skin moisture is balanced, and minimal effort is necessary. Aside from environmental considerations, thermal comfort is determined by mental, social, cultural, and psychological aspects, with expectations varying according to adaptability, exposure, culture, and personal experiences. Solar radiation, severe temperatures, humidity, and wind speed all have an impact on comfort. Overall, thermal comfort is a complicated interaction of environmental, physiological, and psychological variables.

**Methods:** Participants provided feedback through a thermal comfort questionnaire created in accordance with ISO 10551 (1995). MET Malaysia provided weather data, such as temperature, humidity, wind speed, radiant temperature, and precipitation, to investigate the impact of environmental factors on thermal comfort. The Physiological Equivalent Temperature (PET) index, created by Höppe (1999) and frequently utilised in warm, humid settings, was used to evaluate outdoor thermal conditions. RayMan software was used to perform PET calculations, which considered air temperature, air velocity, and humidity, enabling accurate and efficient thermal analysis.

**Results:** Higher air temperatures diminish thermal comfort in Shah Alam ( $r = 0.385$ ,  $p < 0.001$ ), with daily temperatures frequently surpassing 30°C. Limited shade and excessive heat retention exacerbate discomfort, particularly during the wet season, when high humidity causes heat stress and weariness. Relative humidity decreases thermal comfort ( $r = -0.579$ ,  $p < 0.001$ ) by preventing sweat evaporation and decreasing the body's cooling capacity. Even minor reductions during hot afternoons are insufficient to mitigate the overall discomforting effects. Wind speeds of 1.5-2.0 m/s improve thermal comfort by increasing air circulation and perspiration evaporation. Wind lowers Physiological Equivalent Temperature (PET), reducing pain during peak heat and sun radiation.

**Conclusion:** These findings emphasise the significance of implementing strategic urban design initiatives, such as enhancing greenery and providing more shady places, in order to greatly improve thermal comfort in Shah Alam. Increasing vegetation coverage and creating shaded public areas can help offset the effects of high temperatures and humidity, providing residents with a more comfortable outdoor environment while also contributing to improved urban sustainability and liveability.

**Keywords:** Outdoor Thermal Comfort, Air Temperature, Wind Speed, Relative Humidity, Urban Planning

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