Urban Heat Island Effect

The urban heat island effect is the phenomenon whereby urban areas experience higher temperatures than their rural surroundings. This is due to human activities, such as vehicle emissions and air conditioning, and the concentration of buildings that trap heat, creating 'urban canyons' that worsen the temperature rise.

Both global warming and urban heat island effect affect the climate of Hong Kong[1]. According to research from the Hong Kong Observatory (HKO), urban development is one of the factors causing Hong Kong's warming trend and the contribution could be up to 50%[2]. By comparing the annual mean temperature recorded by some individual weather stations of HKO[3], we can reveal the situation about the urban heat island effect in Hong Kong:

Urban areas	Rural areas
Sham Shui Po: 24.6°C	Ta Kwu Ling: 23.8°C
King's Park: 24.3°C	Kadoorie Farm & Botanic Gardens: 21.7°C
Kowloon City: 24.2°C	Tate's Cairn: 20.0°C

With mathematics, we can assess the urban heat island effect by calculating the aspect ratio of urban canyon, which is defined as the average height of buildings divided by

the road width. Here are two examples:

	Scenario 1	Scenario 2
Height of two buildings in an urban canyon	75.8 m and 39.3 m	63.2 m and 51.9 m
Road width	15.0 m	33.2 m
Aspect ratio	$\frac{75.8+39.3}{2(15.0)} = 3.84$	$\frac{63.2+51.9}{2(33.2)} = 1.73$

The narrower and deeper the canyon results in a higher aspect ratio of urban canyon, and it can be acted as a starting point to study the urban heat island effect in Hong Kong in mathematics. For further studies, mathematical modelling of street canyon in the urban areas of Hong Kong can be applied in order to provide in-depth investigation[4].

References:

1. https://multimedia.scmp.com/infographics/news/hong-kong/article/3234514/urban-heat-island/index.html
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