Research Goal

This project will help mitigate existing Urban Heat Island effects in coastal cities in Southeast Asia by identifying Green Structures currently in existence in Singapore. It will also aid in future planning in the region to reduce Heat Island effects by exploring how such buildings can help other cities.

Global Warming

Plenty of phenomena prove that the climate is warming. Scientists discovered that the Earth’s overall air temperature has increased 0.8 degrees Celsius since 1900 (Royal & NCS, 2014). Also, based on the results of temperature monitors, 1983 to 2012 was the warmest thirty year period in the last 800 years (IPCC, 2007). Over the past few decades, global warming has led to more frequent natural disasters as ocean and air temperatures increase (Archer, 2010). Climate change has caused more severe storms, especially for coastal cities. Some adverse issues from global warming cannot be ignored:

• Rising sea levels
• Extreme weather
• Food and water shortages

Urban Heat Island

Urban heat islands result from urban development that has changed land cover, such as roads, parking areas and buildings. Urban landscape surfaces absorb heat during the daytime and release it slowly at night (Nirupama, 2015). In addition, more heat comes from the combustion of industrial and vehicle operating processes. Air-conditioning also contributes large amounts of heat, which further enhances the urban heat island effect (Jusuf, 2007).

Sustainable Urban Planning

Sustainability is the “capacity of something to be maintained or to sustain itself. It’s about taking what we need to live now, without jeopardizing the potential for people in the future to meet their needs” (Land Learn News, ND, p. 1). Sustainable planning combines adaptation and mitigation to create a climate-resilient city. City planning can help coastal cities achieve this through efficient land use by developing appropriate infrastructures. Good planning enhances the quality of life because it is the root of both adaptation and mitigation strategies. Increased greenery coverage accomplishes this.

Construction Materials and Thermal Performance

Materials with high reflectance rates gain less solar heat during daytime than other materials. In urban areas, there is a strong relationship between building surfaces and surrounding air temperatures. Surface color also has different ability for solar heat absorption. Darker surfaces have higher temperatures than light colors (Wong, n.d., p. 2).

Singapore strategy: Green infrastructures combined with building

A.Ground Greenery  B. Green wall  C. Sky Terrace  D. Roof Garden

Conclusion

Regional planners of coastal cities need environmental awareness to plan for, adapt to and mitigate the impacts of climate change. Through the case study of Singapore’s greenery construction, it is possible for Southeast Asian coastal cities to alleviate urban heat island effects by using vegetation to cover building surfaces like roofs, walls, and terraces. This not only increases open space but also helps reduce energy consumption and lower temperatures. All coastal cities in the tropics should consider sustainable solutions, such as green infrastructure, to reduce greenhouse gas emissions, clean the air, and alleviate urban heat island effects.

Figure 1. Relative temperature derived from thermal band of Landsat-7 ETM+ acquired on 11 October 2002 and the “urban” and “rural” partition of Singapore.
