

Maximum Heat Index in Tropical Urban Area of Jakarta

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BACKGROUND

People living in tropical urban regions periodically suffers extreme heat events due to the combination of high temperature and high humidity, moreover rapid population and urban growth also exacerbates the atmosphere condition (Chow and Roth, 2006; Jamei et. al., 2020).

Jakarta is one of the urban areas in tropical regions which experienced rapid population and urbanization growth. The air temperature in Jakarta increased about 0.152°C per decade during 1901-2002 (Subarna, 2017).

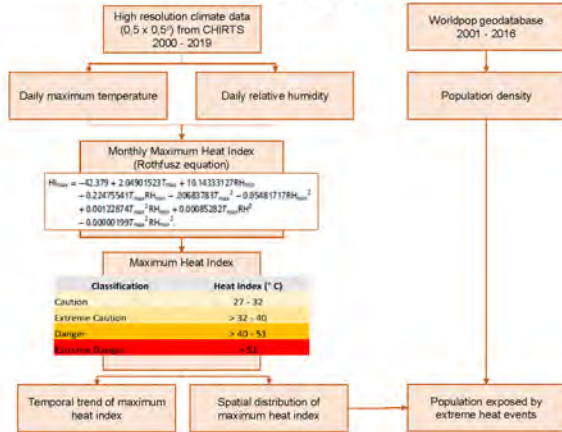
This study attempted to identify maximum heat index in tropical urban area of Jakarta and assess population exposed to the heat extreme events.

High resolution climate data (0.5 x 0.5 °) from CHIRTS were processed to determine heat index exposure in Jakarta. At the same period, the population density data were collected from Worldpop geodatabase to calculate number of populations exposed by extreme heat events.



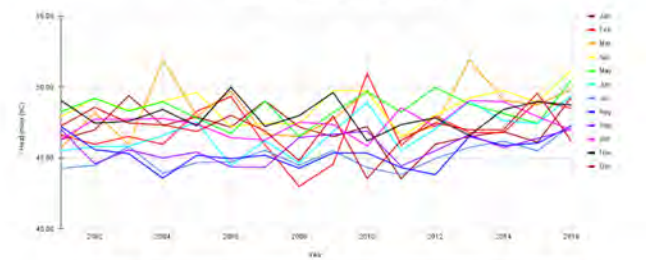
Tropical urban area of Jakarta, Indonesia

METHOD



RESULTS AND DISCUSSION

Monthly Maximum Heat Index

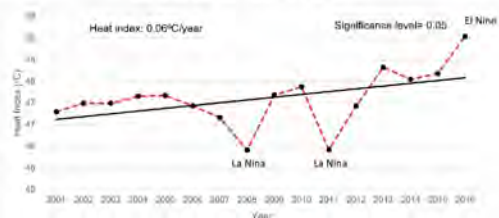


Temporal distribution of monthly maximum heat index during 2001-2016

Higher heat index frequently occurred in transition period of wet season into the dry season (March, April, and May). The period's characteristic is hot and humid but less precipitation. Lower heat index occurred in July, August, and September, when the dry session period up to the transition period from the dry season into the wet season.

RESULTS AND DISCUSSION

Trend of Maximum Heat Index

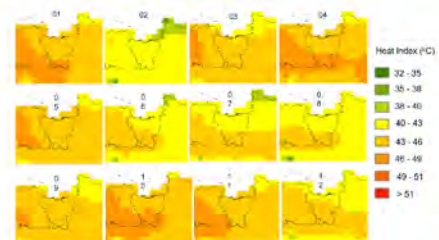


Trend of annual average of maximum heat index during 2001-2016

Generally, maximum heat index has the positive trend during 2001-2016. Maximum heat index tended to be increase around 0.06 °C per year. The lower heat index happened in 2008 and 2011, there was strong La Nina. Meanwhile the higher heat index was in 2016, El Nino occurred in Indonesia.

RESULTS AND DISCUSSION

Spatial Distribution of Maximum Heat Index

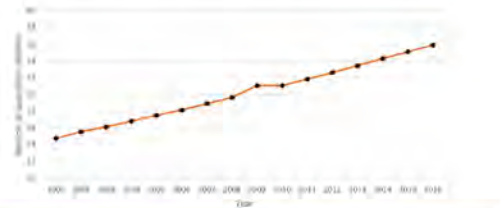


Spatial distribution of monthly maximum heat index during in 2008

Higher heat index located was in the west part of Jakarta due to the high humidity and high temperature. At the city center, the temperature was higher, but the humidity was much lower.

RESULTS AND DISCUSSION

Population Exposed by Extreme Heat Events



Number of population exposed by extreme heat events in 2001-2016

The maximum heat index in Jakarta was mostly above 40°C which is classified as danger condition. The number of population exposed to extreme heat events in Jakarta gradually increased during 2001-2016. This was related to the uncontrolled population growth in Jakarta. In 2016, more than 34 million people suffered from extreme heat events.

CONCLUSION AND FUTURE WORKS

- Jakarta as a tropical urban area has experienced extreme heat events, proven by the heat index value in Jakarta mostly above 40°C, classified as danger condition.
- The highest heat index frequently occurred in March, April, and May. Oppositely, the lowest heat index mostly happened in July, August, and September.
- The annual average of maximum heat index showed the positive trend from 2001 to 2016 with approximately up 0.06 °C /year. However, there were certain years which experienced lower heat index.
- Number of population exposed by the extreme heat events gradually increased during 2001 to 2016.
- It is important for further analysis about the factors related to extreme heat index, such as land cover change or anthropogenic emission. We need to assess the risk of urban areas to urban heat extreme events.