NANYANG TECHNOLOGICAL UNIVERSITY

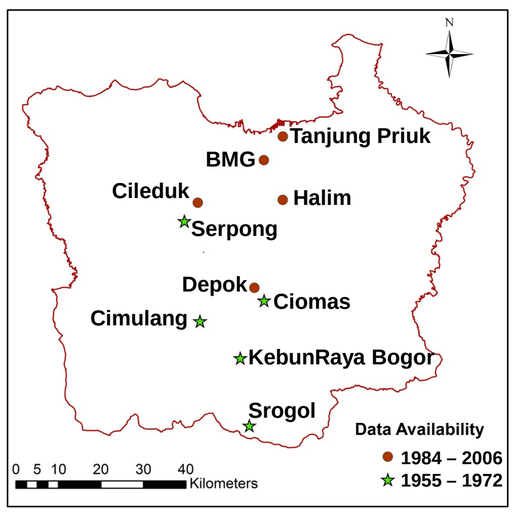
Institute of Catastrophe Risk Management

Dr Pradeep Mandapaka
A/P Qin Xiaosheng
A/P Lo Yat-Man Edmond
Ms Daksiya Velautham

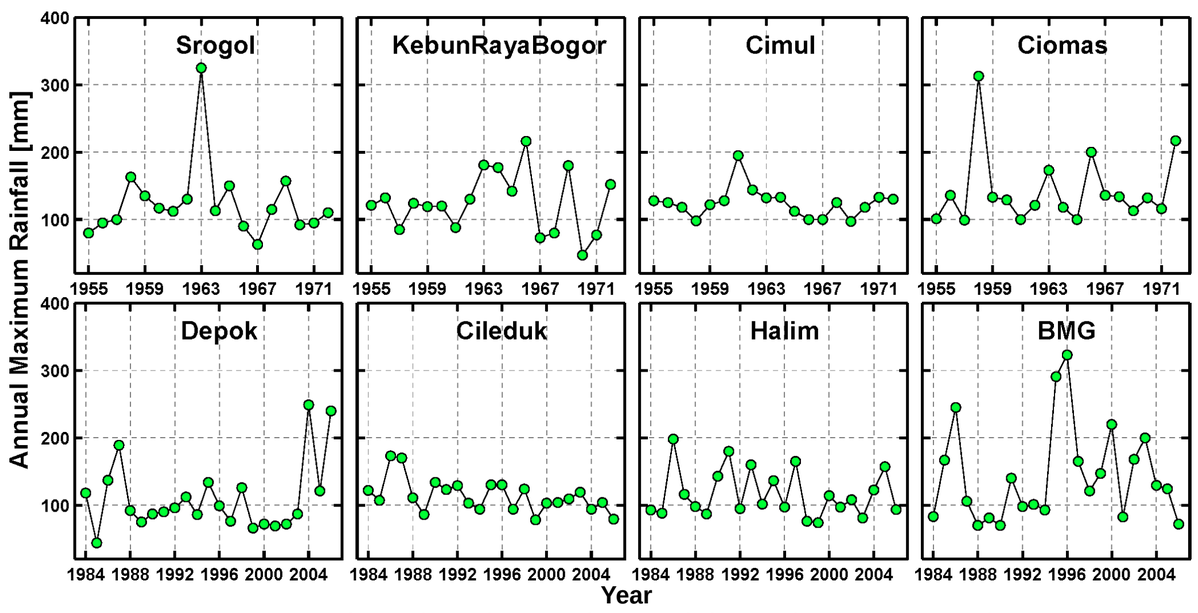
Future Rainfall Intensity-Duration-Frequency Curves in Jakarta under Climate Change

Assessment of the effect of changing climate conditions on the intensity and frequency of daily rainfall in Jakarta using historical data from rain gauges and projections from the global climate models. We adopt a weather generator approach to generate long synthetic daily rainfall time series for historical and future conditions, and perform frequency analysis on the synthetic data to obtain intensity-duration-frequency (IDF) curves.

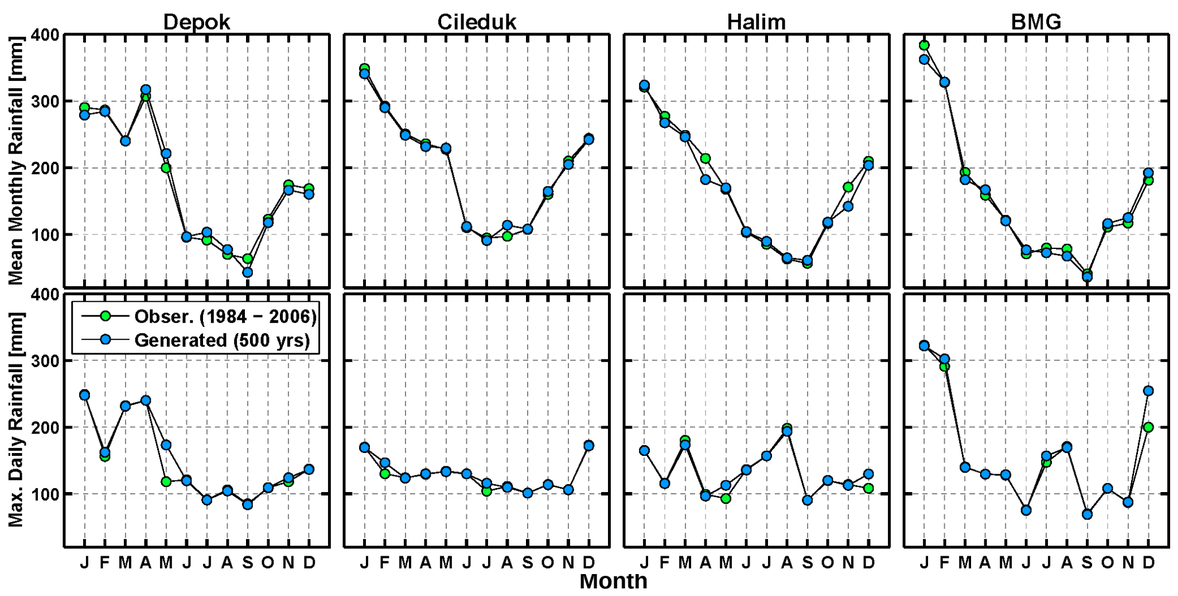
- **Rain gauge data used**
  - Daily data at ten stations
  - Two historical time periods (1955 – 1972 and 1983 – 2006)
- **Weather generator**
  - LARS-WG model
  - Semi-empirical probabilities and change factor approach are used.
- **Global climate model projections**
  - 15 climate models
  - Time period: 2045 - 2065
- **Frequency Analysis - IDF curves**
  - Log-Pearson fit to annual maxima



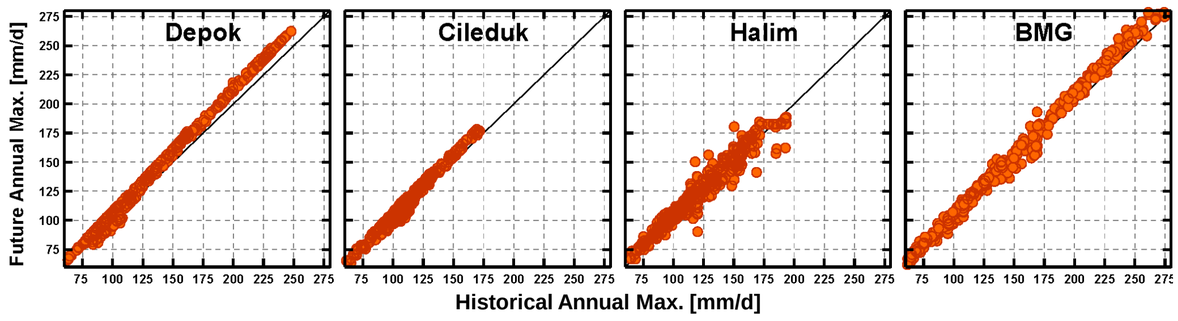
Rain gauge stations with daily rainfall data



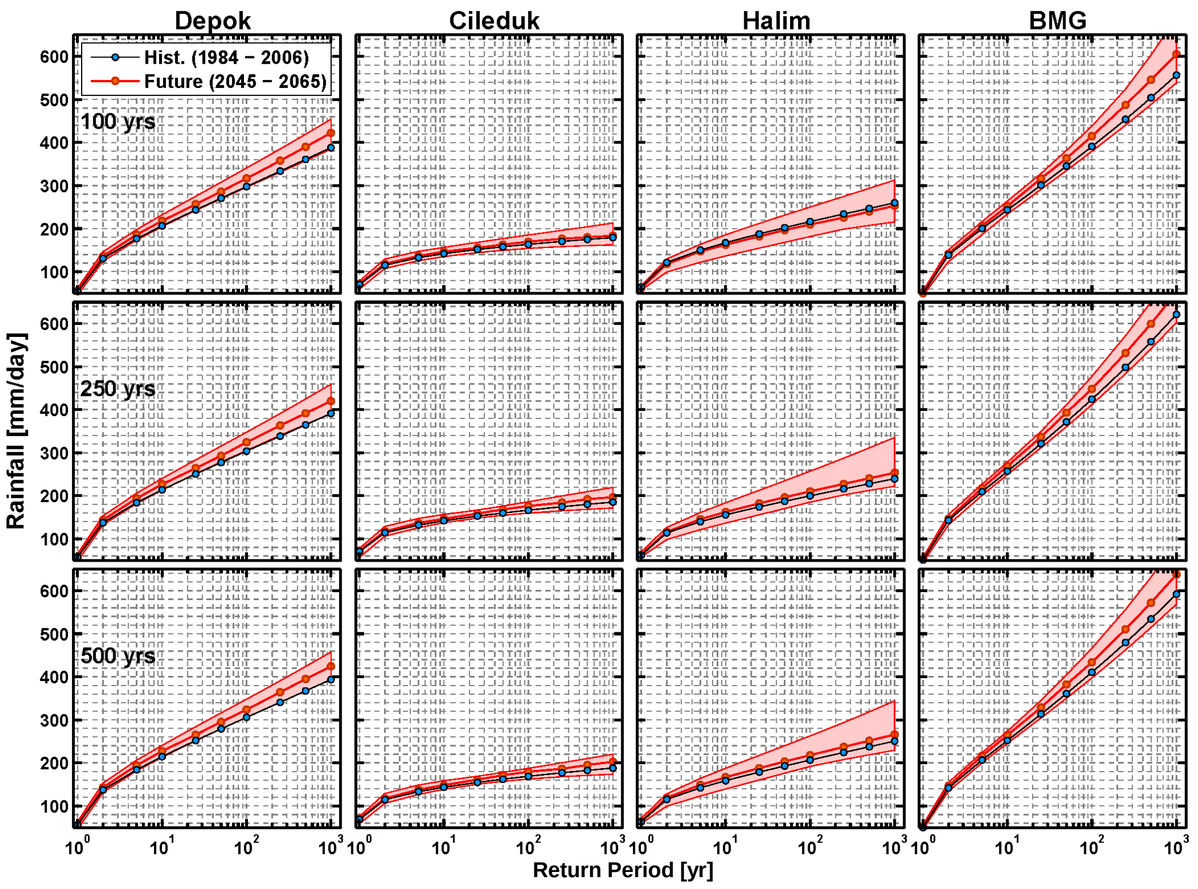
Annual maxima time series at eight stations representing two historical time periods (1955 – 1972 and 1984 – 2006)



Assessment of LARS-WG performance: Comparison of mean monthly and maximum daily rainfall extracted from observations and LARS-WG synthetic time series



Comparison of annual maximum daily rainfall for historical (1984 – 2006) and future (2045 – 2065) time period. The annual maxima are extracted from the 500 years of time series generated for each time period using LARS-WG model.



Comparison of Intensity-Duration-Frequency curves obtained using synthetic time series of different lengths for historical and future time periods. Shaded region represents uncertainty resulting from the use of 15 climate models.

Results and Future Work

- IDF curves were obtained using synthetic time series generated for historical and future time periods.
- Percentage change between historical and future (15-model median) rainfall IDF curves is small.
- Inter-model uncertainty in future IDF curves is significant.
- Efforts are underway to propagate uncertainties in IDF curves through hydrologic modelling framework.

Contact Us:
Executive Director, ICRM (ExecDir-ICRM@ntu.edu.sg)
N1-B1b-07, 50 Nanyang Avenue, Singapore 639798
Tel: +65 6592 1866 Website: http://icrm.ntu.edu.sg