

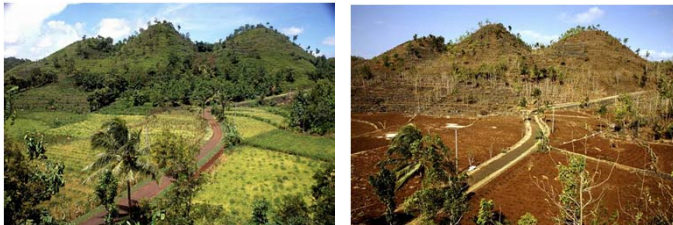
# Hydrological Assessment with respect to Climate Phenomena in a Karst Area, South Java, Indonesia

Investigation of Hydrological Conditions within IWRM-Indonesia Project

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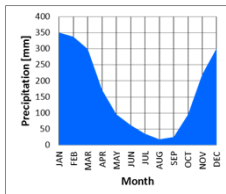
## 1. Study Area

- Karst area 'Gunung Sewu' ("Land of thousand hills", 1,400 km<sup>2</sup>) at District of Gunung Kidul, Indonesia, with hundreds of networked underground caves
- Total exchange of the surface run off to an underground river system due to karst infiltration
- Severe water scarcity during dry seasons
- Unsuccessful attempts for effective use of the underground water resources



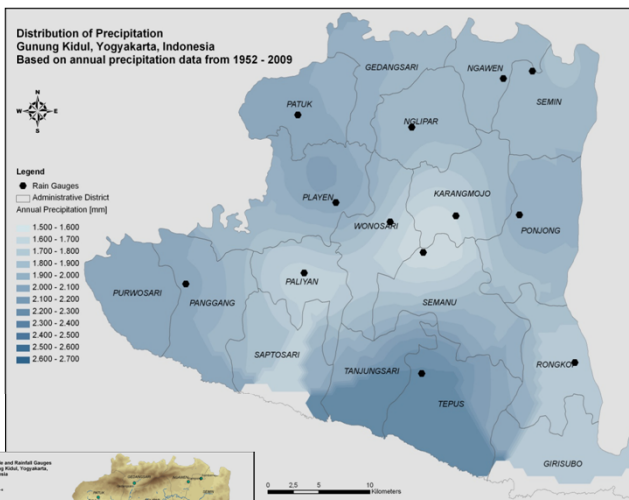
Left: Gunung Kidul during rainy season. Right: Gunung Kidul during dry season.

## 2. Hydrological Conditions in Gunung Kidul

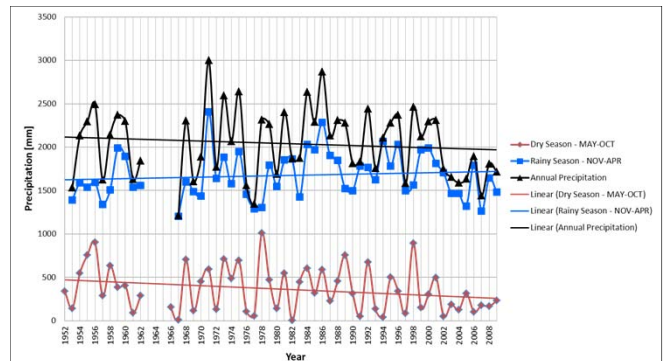


Monthly distribution of annual precipitation in Gunung Kidul for the years 1952-2009

- Described as tropical winter monsoon climate where the alternation of dry and rain seasons is attended by the movement of the Intertropical Convergence Zone and the trade winds.
- The average annual precipitation is approximately 2000 mm.
- Average rain frequency of 20 days / month during rainy season and < 3 days / month during dry season.



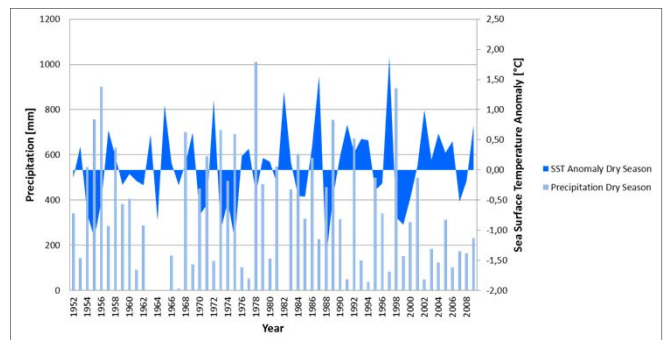
Spatial distribution of precipitation in Gunung Kidul based on annual data from 1952-2009 from 17 selected rainfall gauges. The spatial variation depends on the proximity to the sea and the altitude.



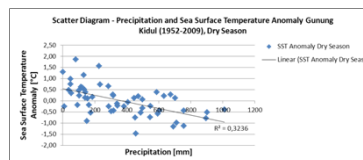
The hydrological data for the past 58 years shows a decreasing trend of rain intensity especially during the dry periods as well as a strong decrease of the total precipitation between 2002 – 2009.

## 3. El Niño and La Niña Phenomena

- Occurrence of El Niño resp. La Niña events correlate with SST (Sea Surface Temperature) Anomaly (especially when SST Anomaly exceeds  $\pm 0,5$  °C)
- The El Niño and La Niña events have influences on the rainfall variation in the dry period with either years of extremely low or high rainfall rates

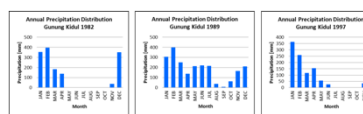


Time series of Sea Surface Temperature Anomalies of the Nino Region 3.4 and precipitation in Gunung Kidul; for May to October from the years 1952 to 2009



Scatter Diagram: Precipitation in Gunung Kidul related to Sea Surface Temperature Anomaly (Dry Seasons 1952 – 2009)

- 32% of the precipitation scattering is related to the Sea Surface Temperature Anomalies



Left and right: Precipitation during El Niño events. Middle: Precipitation during La Niña events.

- Especially in years with a positive or negative SST Anomaly, corresponding precipitation data of the dry season shows significant deviations to average values

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