Intensifying Wet Extremes in the Uplands and Drying in the Lowlands of Java Island:
Past and Future Trends and Their Implications

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Background

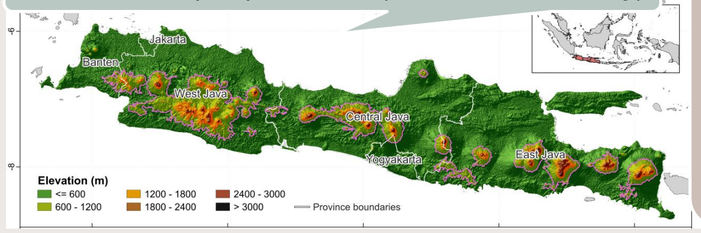
Future **Temperature & rainfall** → Change in **Weather Extremes** → Impact on Population, agriculture, environment.

The need of **high-resolution projection** in **vulnerable** regions for better mitigation

Java island Indonesia is a **maritime island with complex topography and landuse**

CASE STUDY: JAVA ISLAND

~150 million people reside (56% of the country)



(BNPB, 2023)

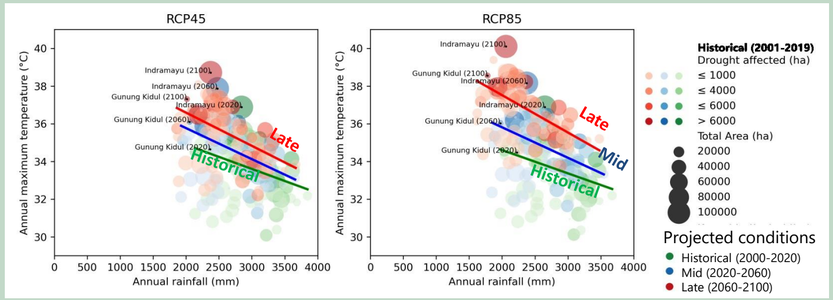
26% of Indonesia's flood and **57%** of drought impacts

Objectives

- ❑ Develop **hazard indicators** for climate extremes in Java, Indonesia.
- ❑ Assess **land use exposure (especially crop)** to future extremes.
- ❑ Relate **historical understanding (current and actual vulnerability) to future threats** (wet and dry extremes) in Java.

Discussion

- ❑ Higher projected **compound dry-heat extremes inducing aggravating drought** overlap with most **agriculturally productive regions** in Java.
- ❑ Future effective **adaptation & mitigation** highly needed in those regions (extensive crop area) such as in: Indramayu, Cirebon, Karawang regency.



Method

Regional Climate Models (RCMs)

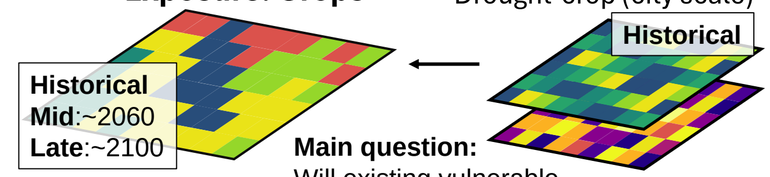
RCP4.5 | RCP8.5 | CORDEX SEA

Extreme Indices (Zhang, 2011) → **Precipitation** (pr), **Temperature** (Tasmax)

Bias correction Downscaling (0.1°) ← Historical data (GPM IMERG & SA-OBS) (2000-2020) (Van et al.,2017)

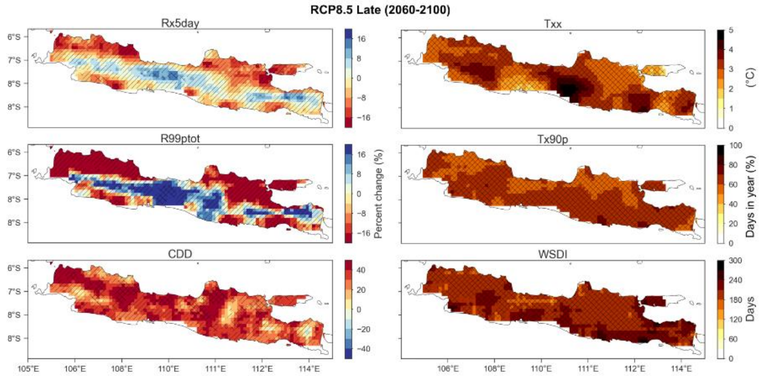
Exposure: Crops

Actual impact data Drought-crop (city scale)



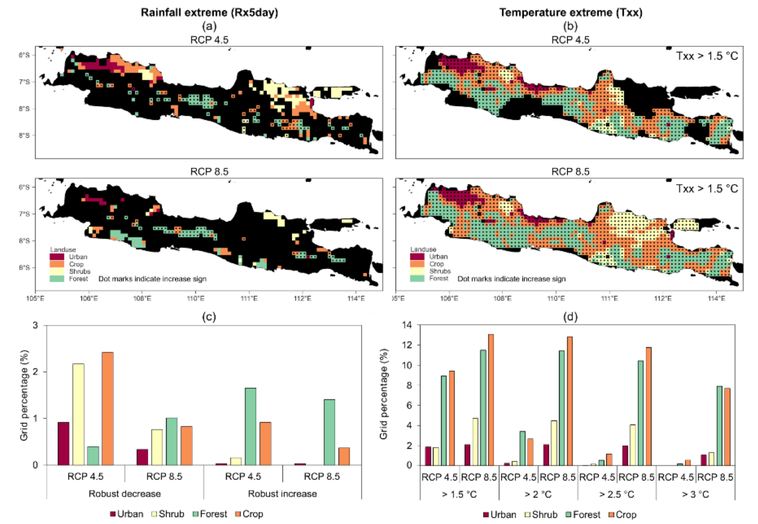
Main question: Will existing vulnerable regions be much threatened in the future?

Results



Mean & rainfall extreme Temperature extreme **in lowland** ↓↑

Rainfall extreme **in highland** ↑

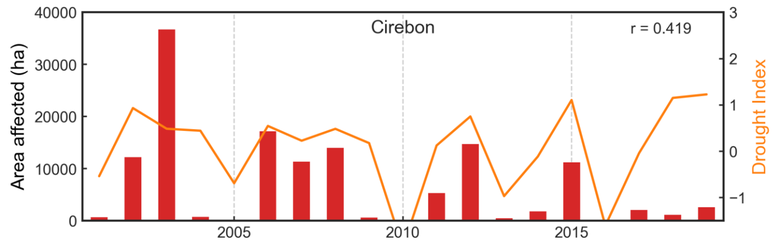


Crop by **around 9%** of the total land, may face **robust drying** (reducing yearly precip.)

Forest: Drought ↓ Rainfall extreme ↑
Crop: Drought ↑

ACTUAL IMPACT: CROP-DROUGHT

Historical **Drought Hazards** (SPI) are associated with **Actual reported** drought-affected crop area (MoA, 2020)



Damage data (2001-2019) in city scale over Java (example in Cirebon regency)

Conclusion

- ❑ Drying in the lowlands by approximately 13–18%, by the end of the century (2099).
- ❑ Extreme temperatures with a 1.7–3.1°C increase in maximum daily temperature.
- ❑ Unprecedented dry-hot events may threaten highly productive and vulnerable regions in Java.

OUR ORIGINAL ARTICLE

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