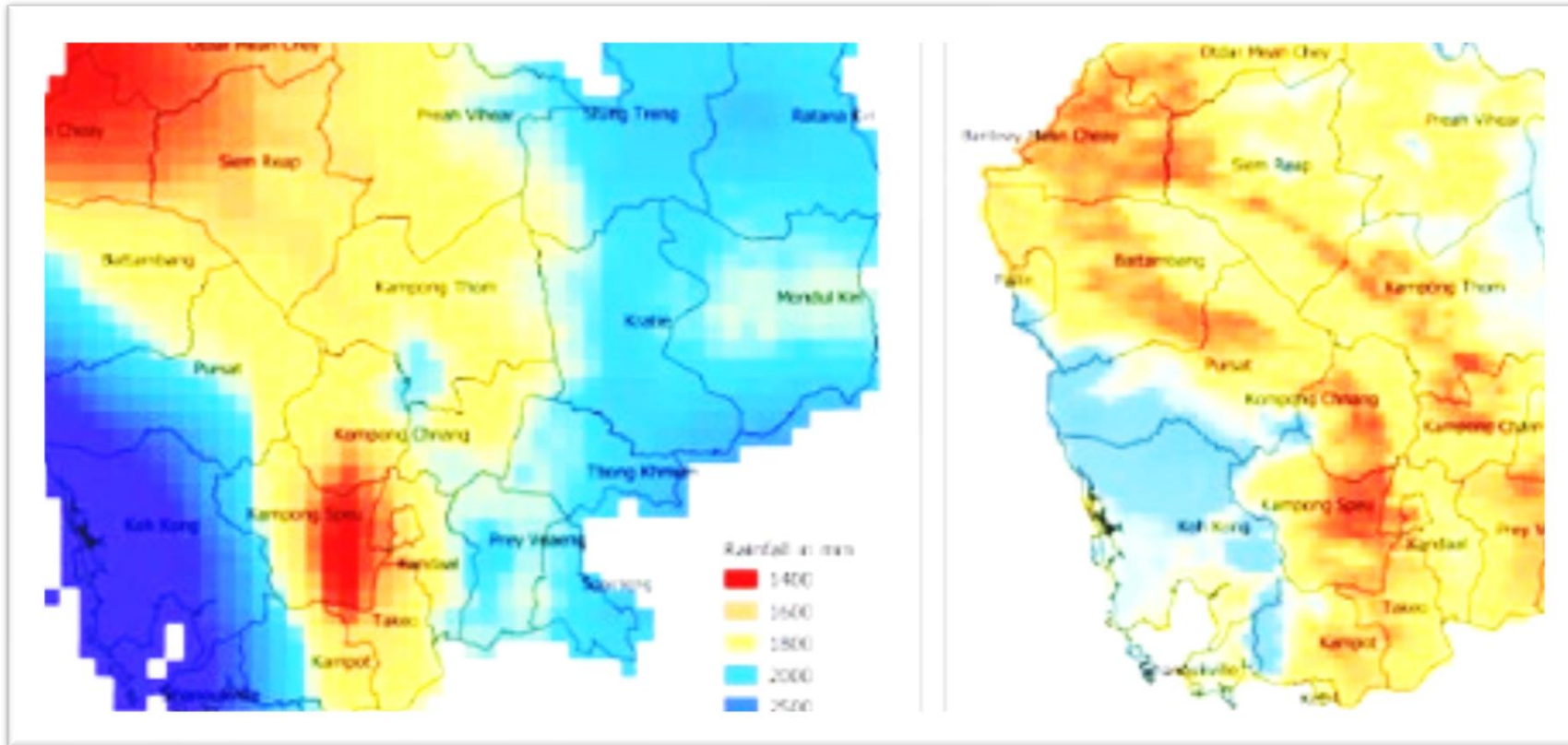


Delineation of Climate Zone in Cambodia

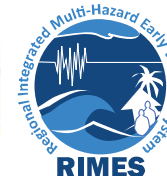
Dr. Jothiganesh S., Team Leader – Climate Application, RIMES

July 9, 2020

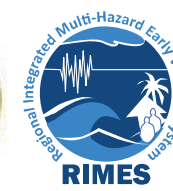


Acknowledgement – Mr. Oum Ryna, Ms. Peou Phalla - DoM; Dr. Muhibuddin Usamah - UNDP; Dr. Itesh Dash, Dr. Yuvaraj Eswaran, Ms. Karthika - RIMES

Strengthening Climate information and Early Warning System in Cambodia



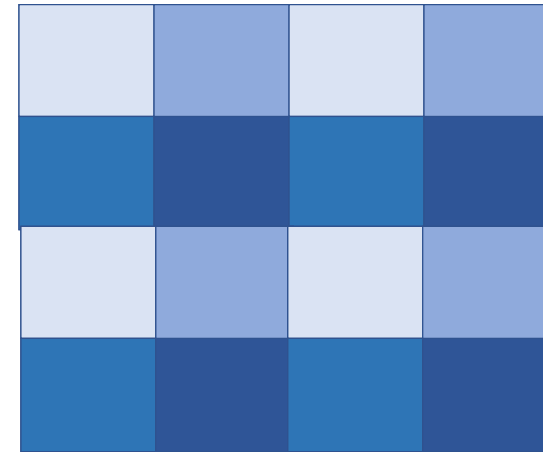
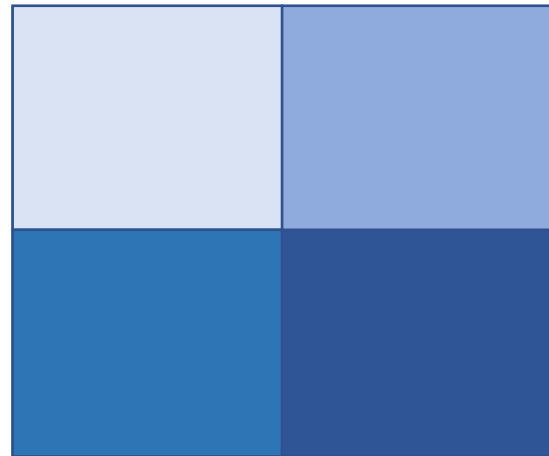
Climate Zone of Cambodia



Fallacies in dealing with spatial Scale (Statistical)



Larger scale

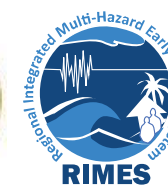


Smaller/Local Scale

Spatial Scale

- **Individualistic fallacy:** Interpolating information from smaller/local scale (location) to larger scale (province)
- **Ecological fallacy:** Interpreting larger scale (e.g. province) to smaller/local scale (location)

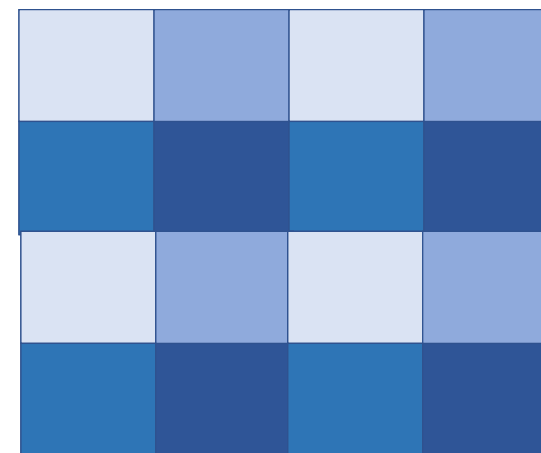
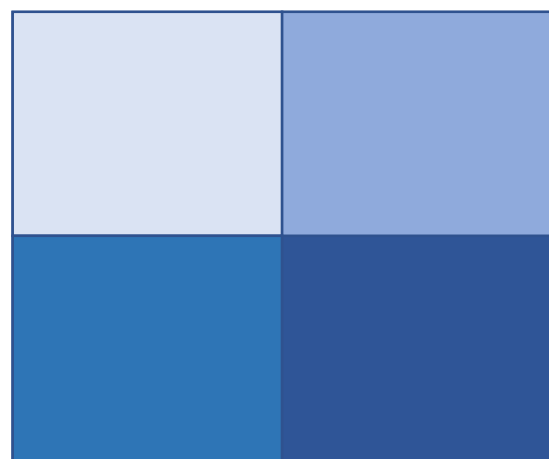
Climate Zone of Cambodia



Spatial Scale and Errors in Longer Lead Forecast



Larger scale



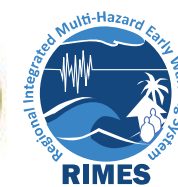
Smaller/Local Scale

Spatial Scale

Low

High

Errors in Longer Lead Forecast are generally low in larger spatial extent and especially over meaningful climatological zones

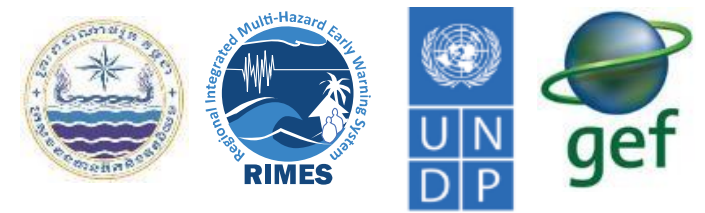


Importance of delineating climate zones

“Climate has its own boundary”

- We need to adjust our human lens to look at it

Climate Zone of Cambodia



Data used

1. Surface observatories: 1980-2017

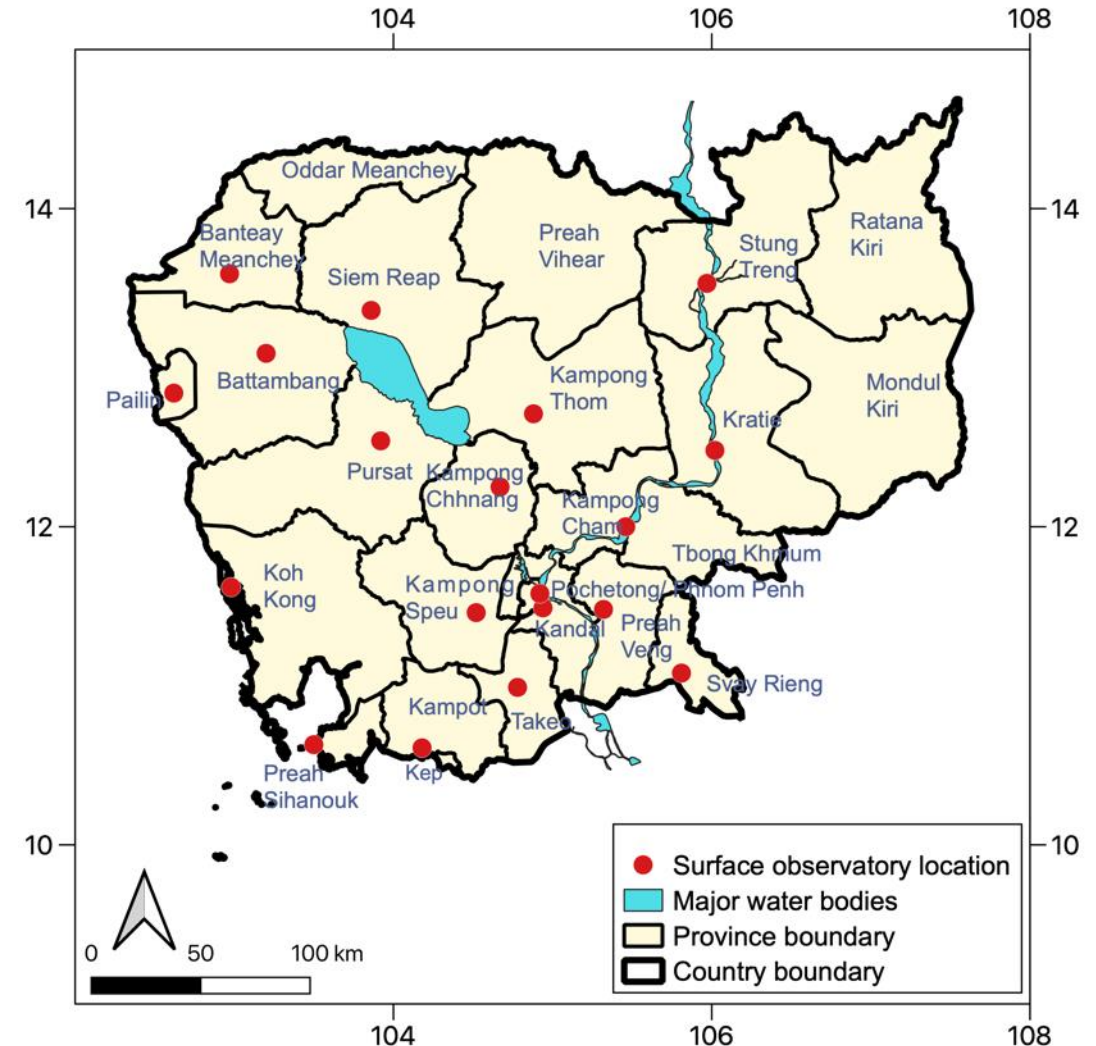
- *Rainfall and Mean temperature from 19 observatories*

2. Satellite based estimates: 2001-2019

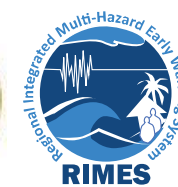
- *Rainfall - NASA's Global Precipitation Measurement (GPM) at 10 X 10km*
- *Temperature – MODIS Land Surface temperature at 5 X 5 km*

3. Reanalysis – Observed + Modeled: 2001-2019

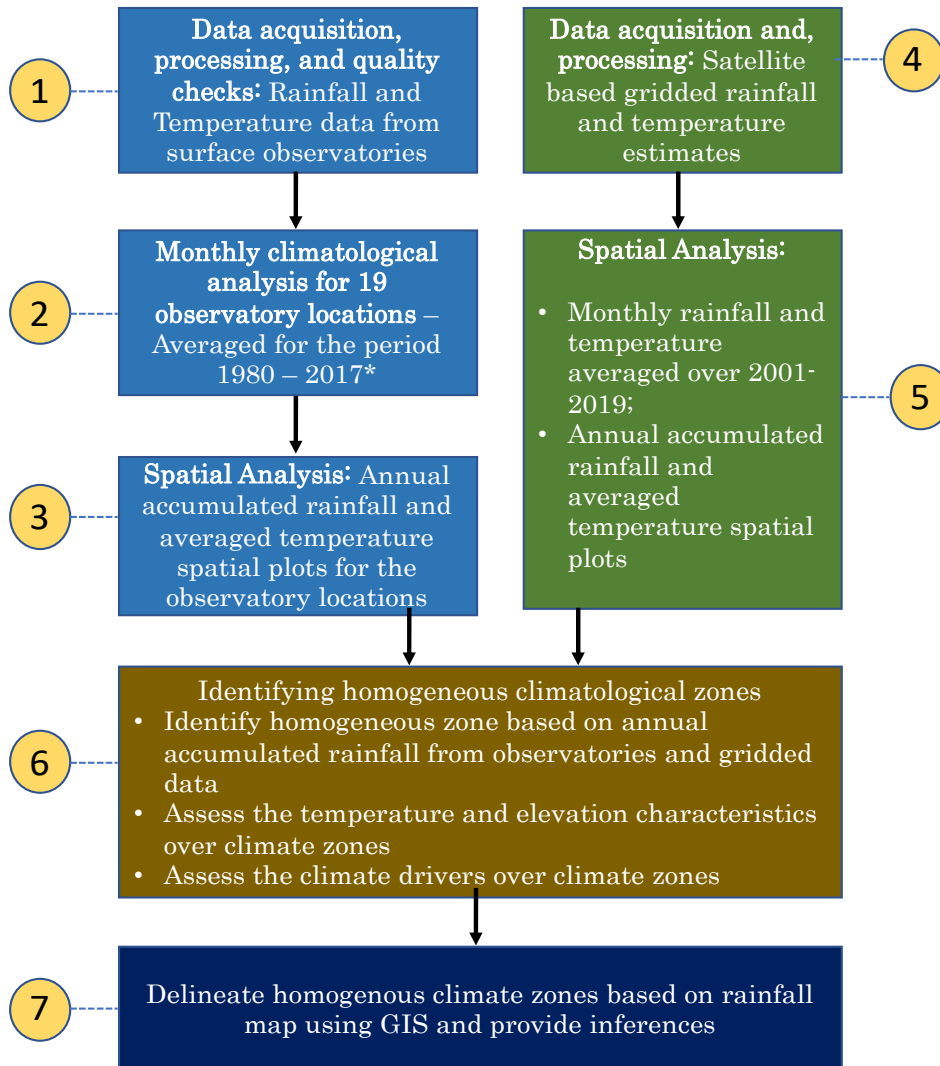
- *Winds, Mean Sea Level Pressure from ERA-Interim*



Climate Zone of Cambodia

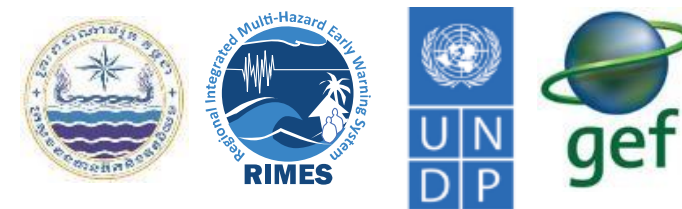


Methodology



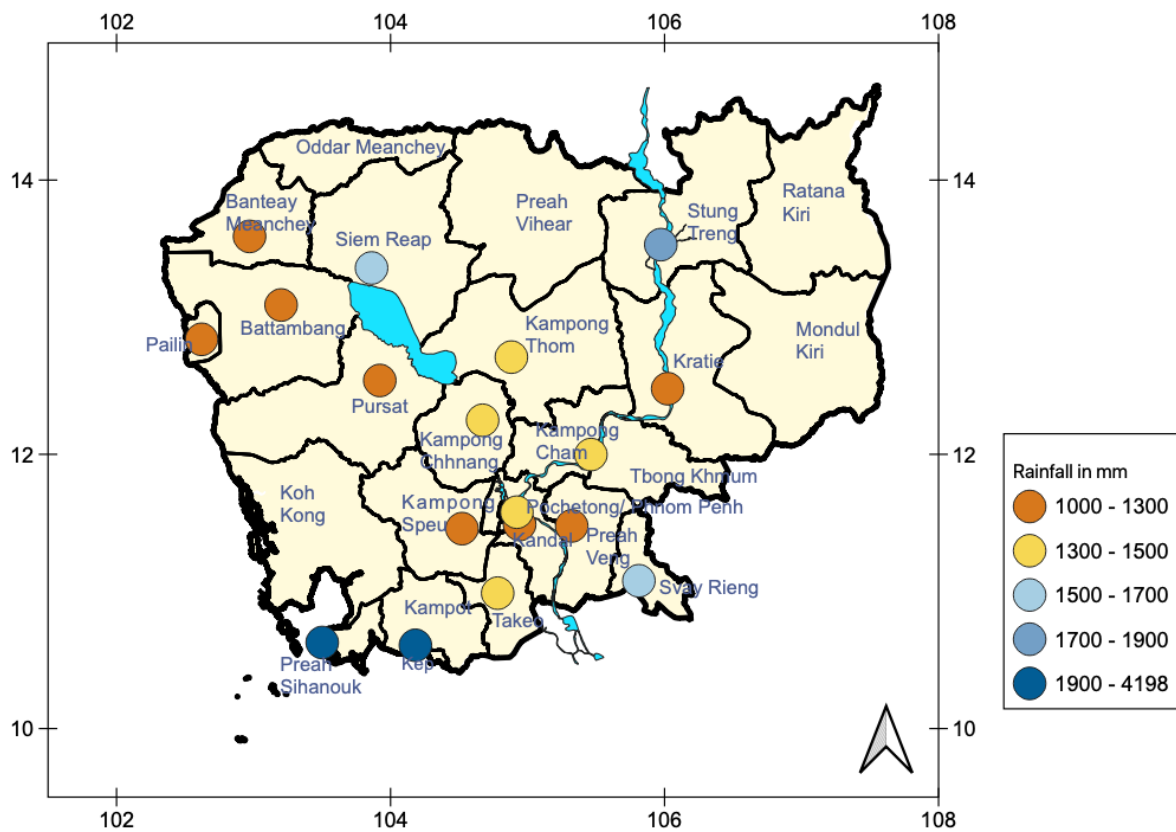
- **Data, acquisition, processing, and quality checks** (Surface Observatory+ Satellite based estimates)
- **Spatial analysis and Monthly climatological analysis using surface observatory data**
- **Comparing with Satellite based estimates**
- **Identifying homogeneous climatological zones and understanding its climate drivers**
- **Climate Zone Delineation**

Climate Zone of Cambodia

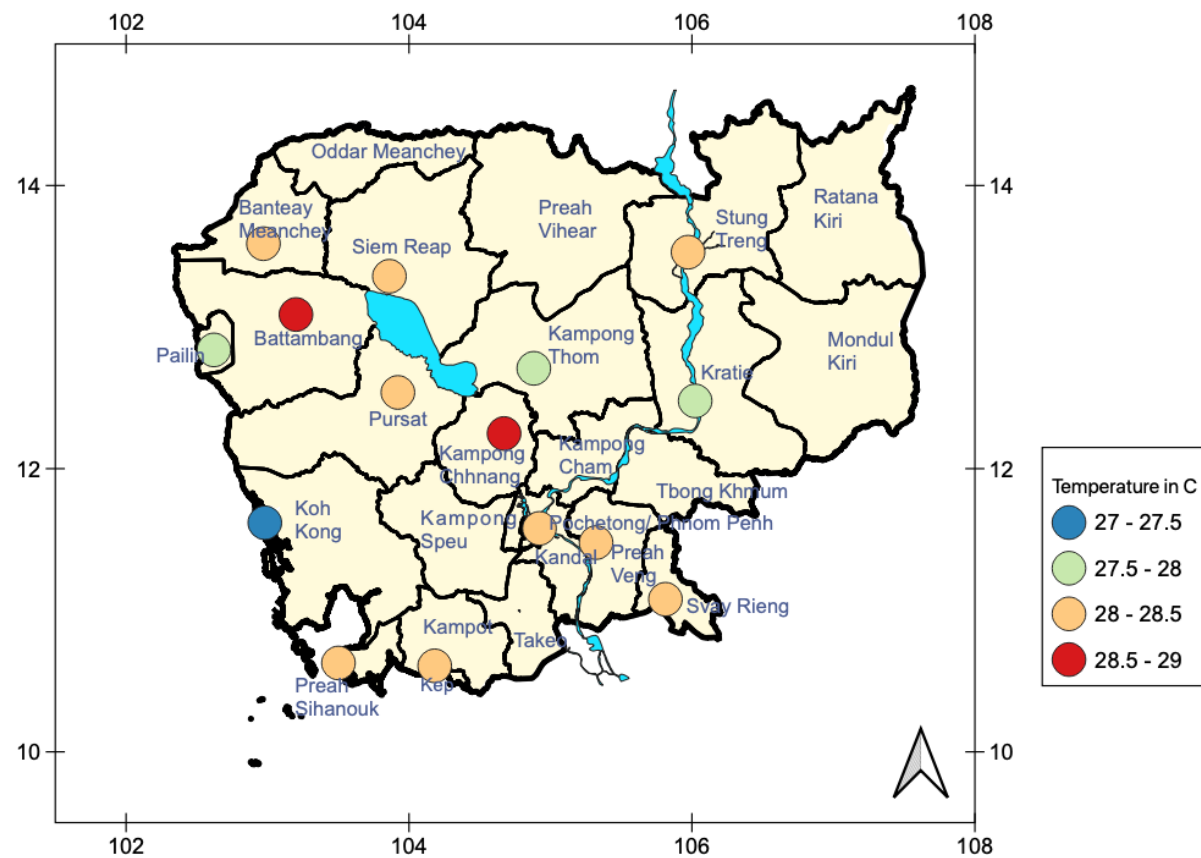


Spatial variability of annual rainfall and temperature

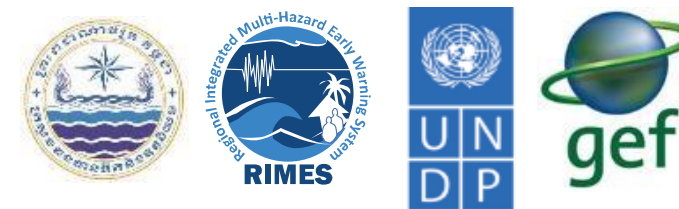
Accumulated Rainfall



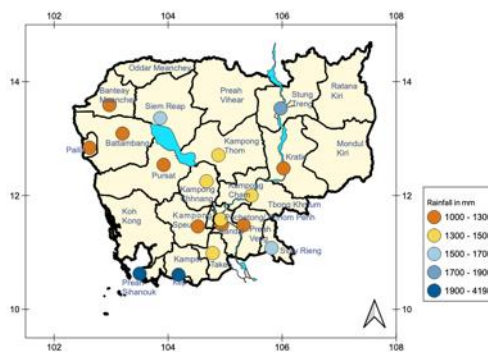
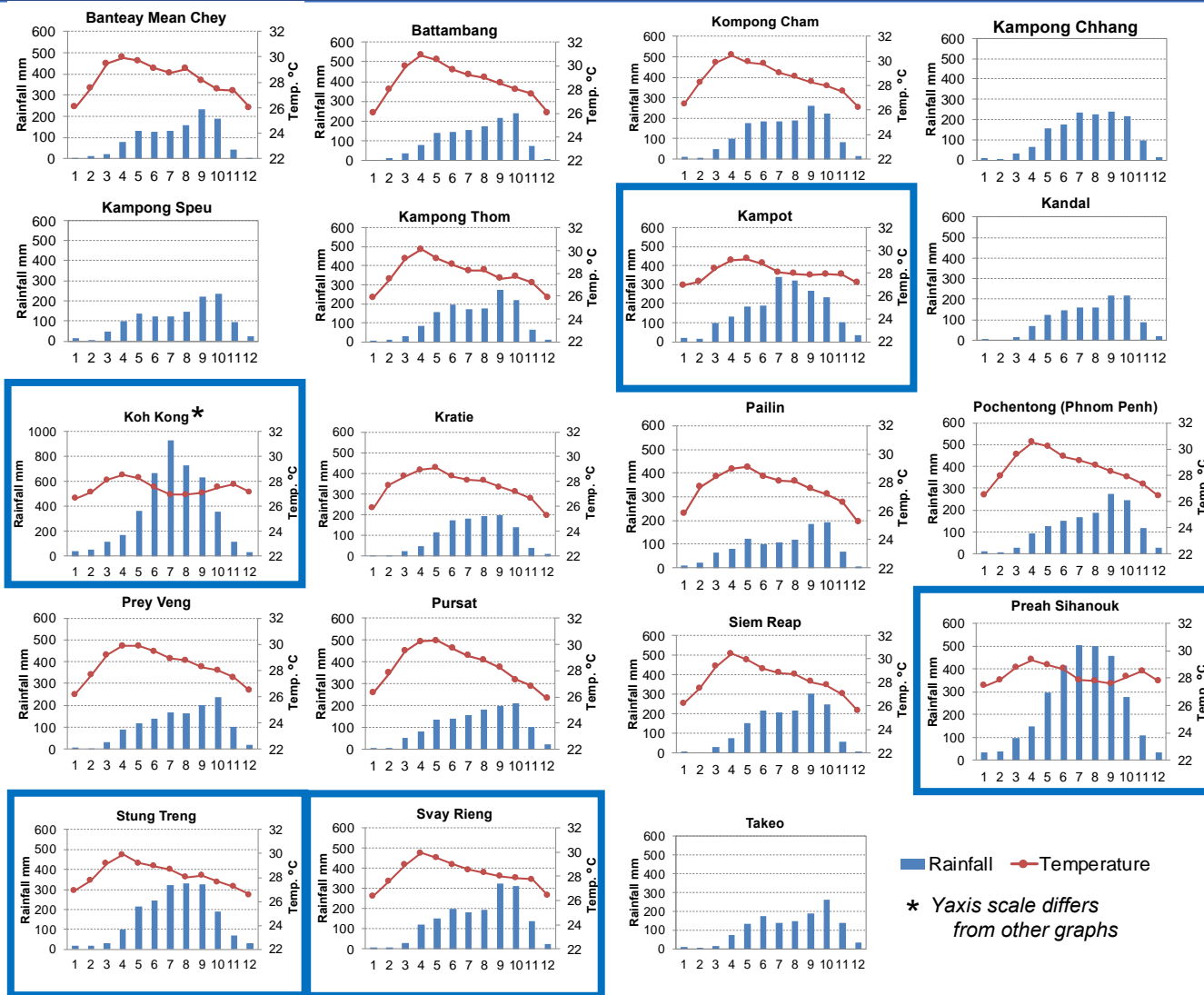
Mean Temperature



Climate Zone of Cambodia

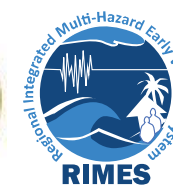


Temporal variability - Monthly rainfall and temperature climatology



1. *Very Heavy rainfall and July peak – Koh Kong, Preah Sihanouk, Kampot (South West)*
2. *Heavy rainfall and Sep peak – Stung Treng (North East)*
3. *Heavy rainfall and Oct peak – Svay Rieng (South East)*
4. *Progression of monsoon season – West-East*

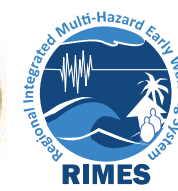
Climate Zone of Cambodia



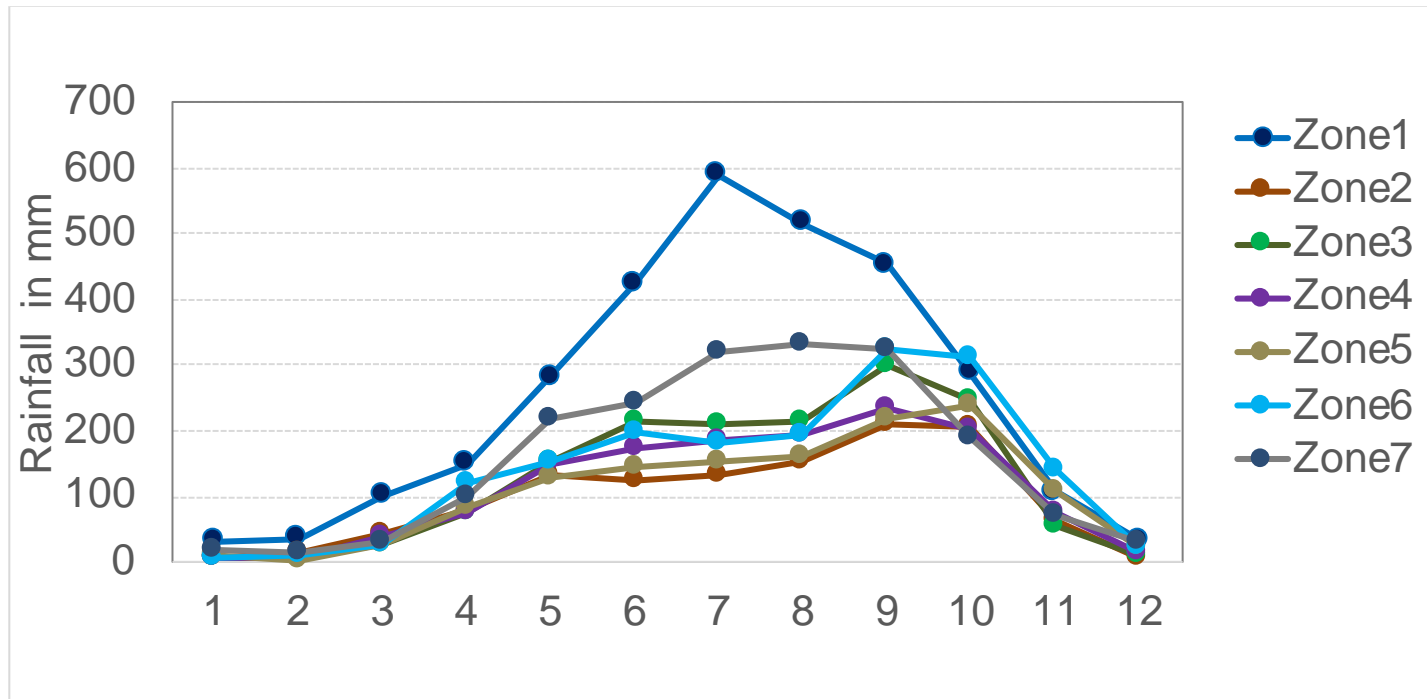
Climate Zones

Zone	Stations	Rainfall characteristics	Annual Rainfall (mm)	Name of the zone
Zone 1	Koh Kong, Preah Sihanouk, Kampot	Very Heavy	1931 to 4201	South-west/Coastal
Zone 2	Pailin, Battambang, Banteay Mean Chey	Low	1079 to 1294	North-west/Continental
Zone 3*	Siem Reap	Heavy	1520	North central/Continental
Zone 4	Pursat, Kampong Thom, Kampong Chhang, Kampong Cham, Kratie	Moderate	1135 - 1468	Central Plains/Continental
Zone 5	Kampong Speu, Pochentong/Phnom Penh, Kandal, Prey Veng, Takeo	Low	1261	South-central/Continental
Zone 6	Svay Rieng	Heavy	1689	South-east/Continental
Zone 7	Stung Treng	Heavy	1891	North-east/Continental

Climate Zone of Cambodia

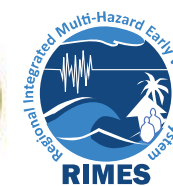


Climate Zones

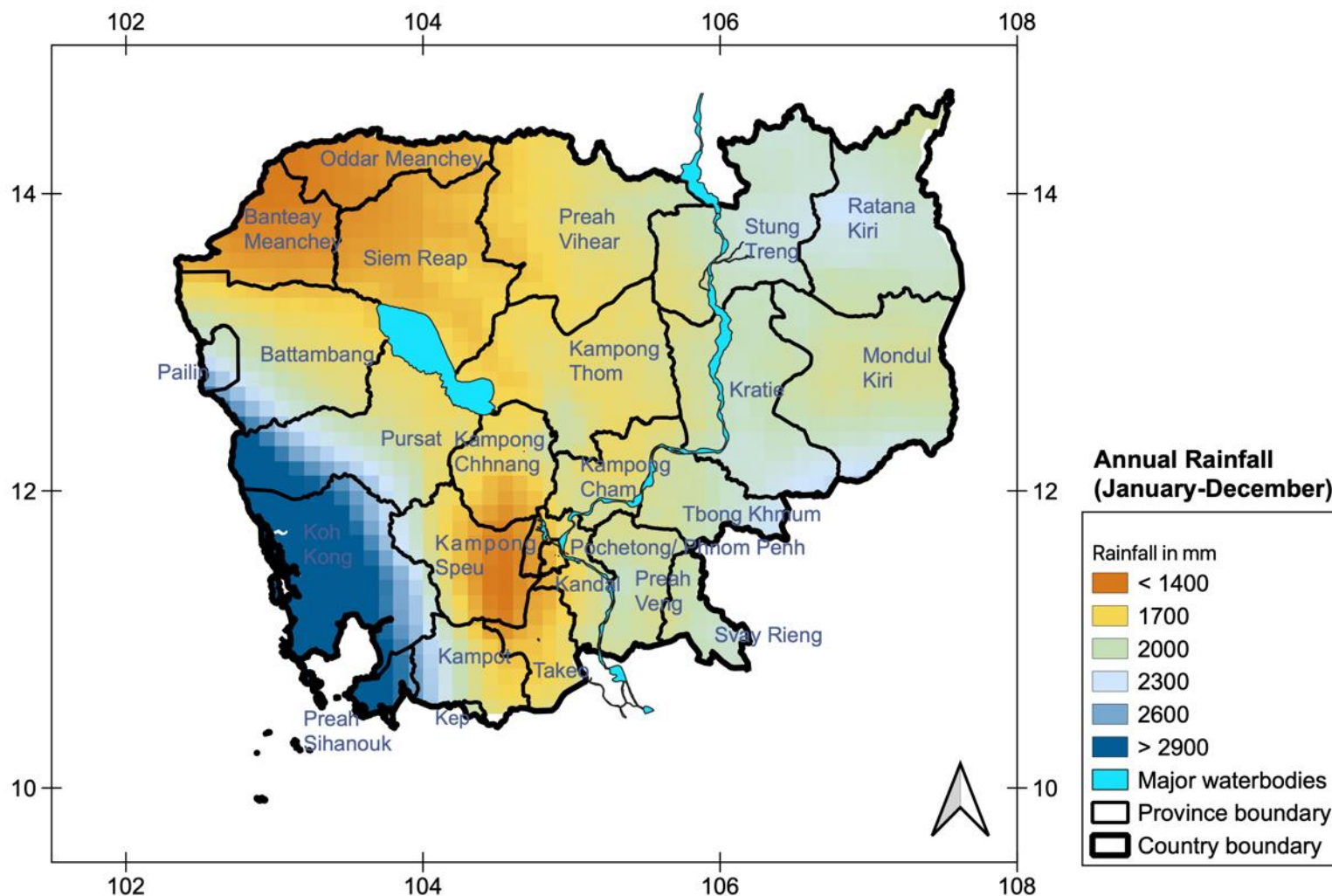


Zone	Stations	Rainfall characteristics
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Zone 6	Svay Rieng	Heavy
Zone 7	Stung Treng	Heavy

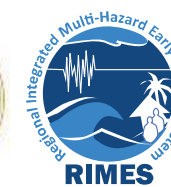
Climate Zone of Cambodia



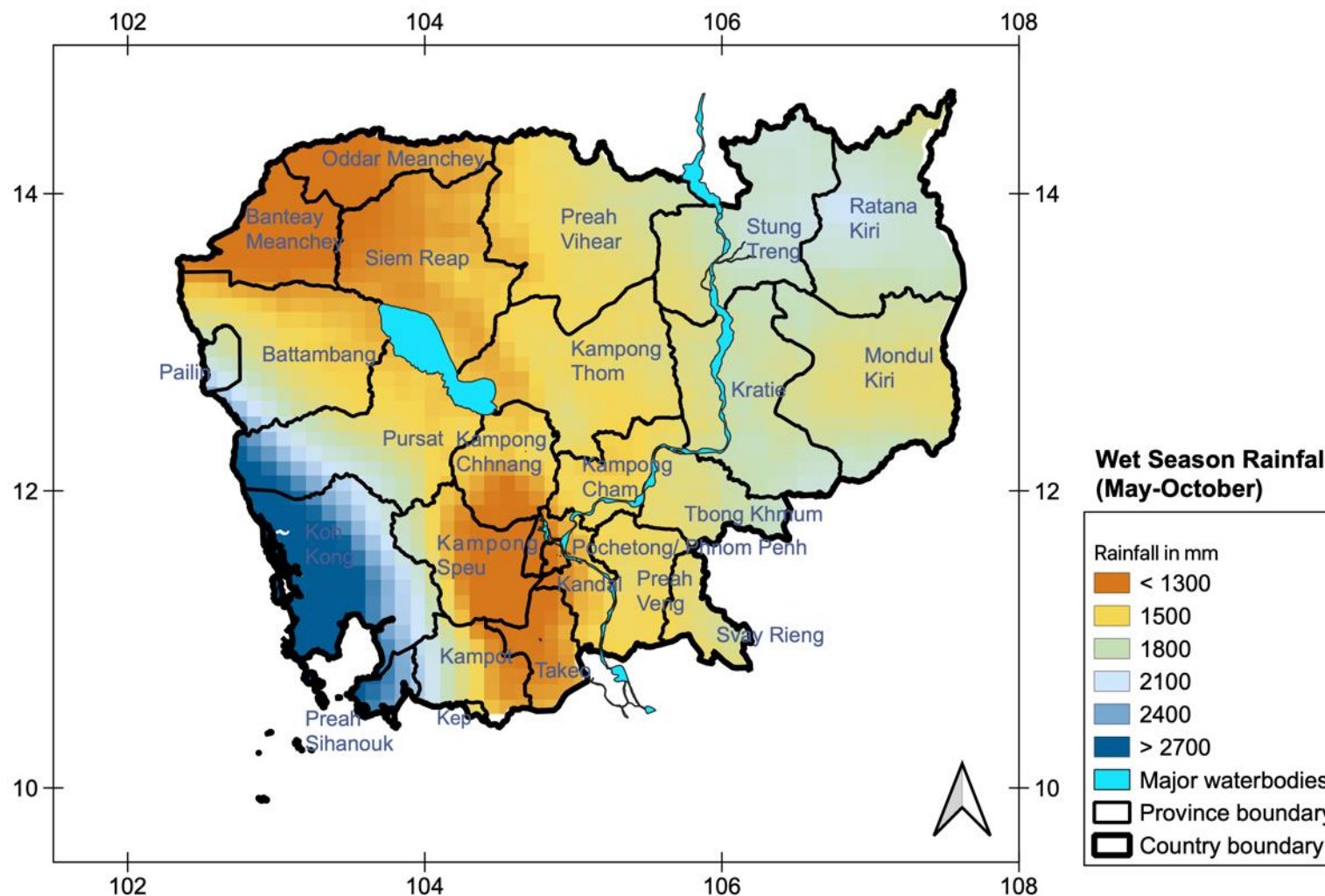
Inference from Satellite based estimates – Annual rainfall



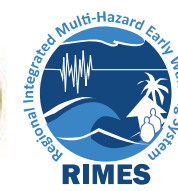
Climate Zone of Cambodia



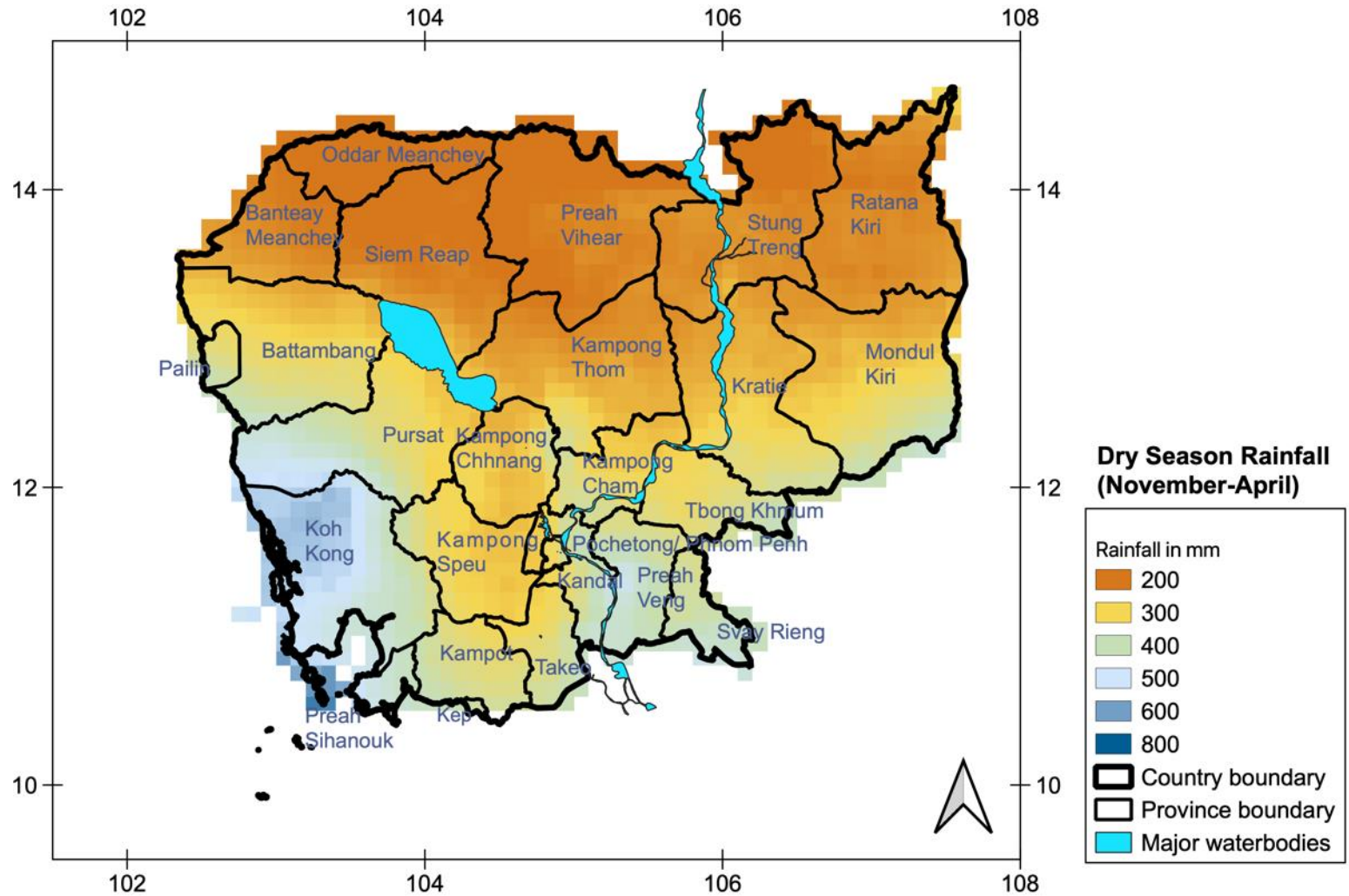
Satellite based estimates – Wet Season Rainfall



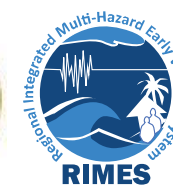
Climate Zone of Cambodia



Satellite based estimates – Dry Season Rainfall

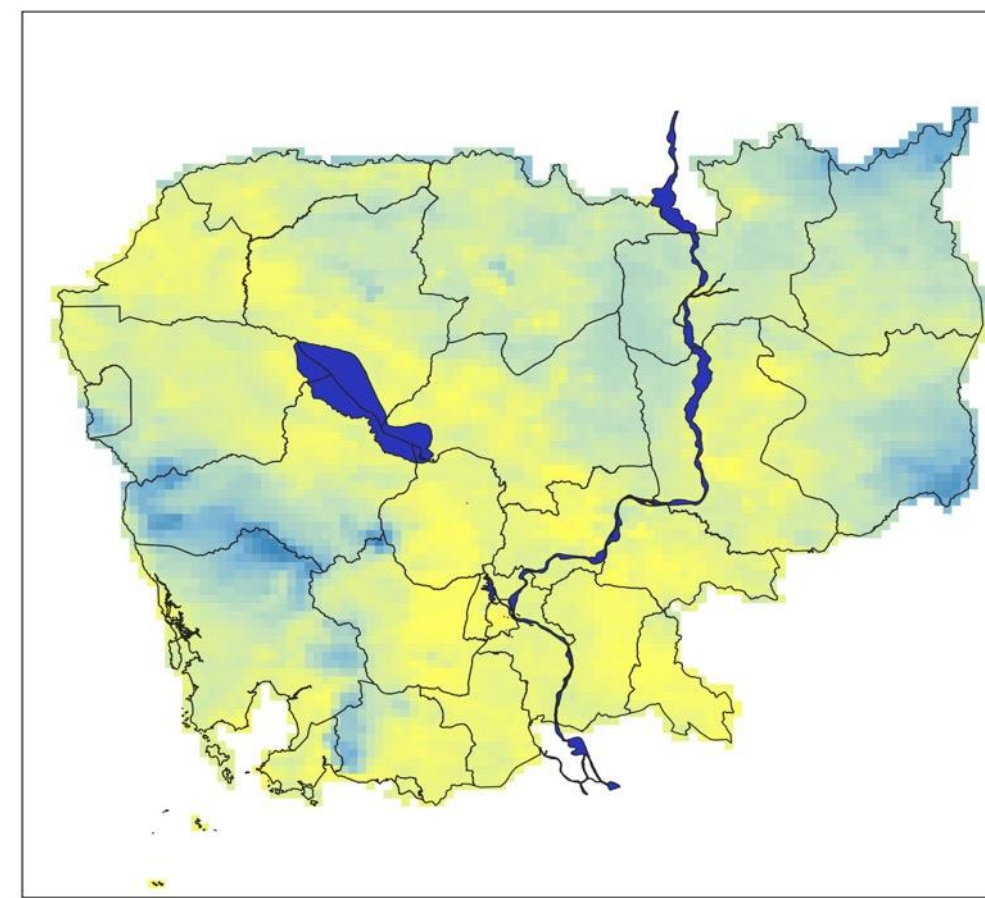
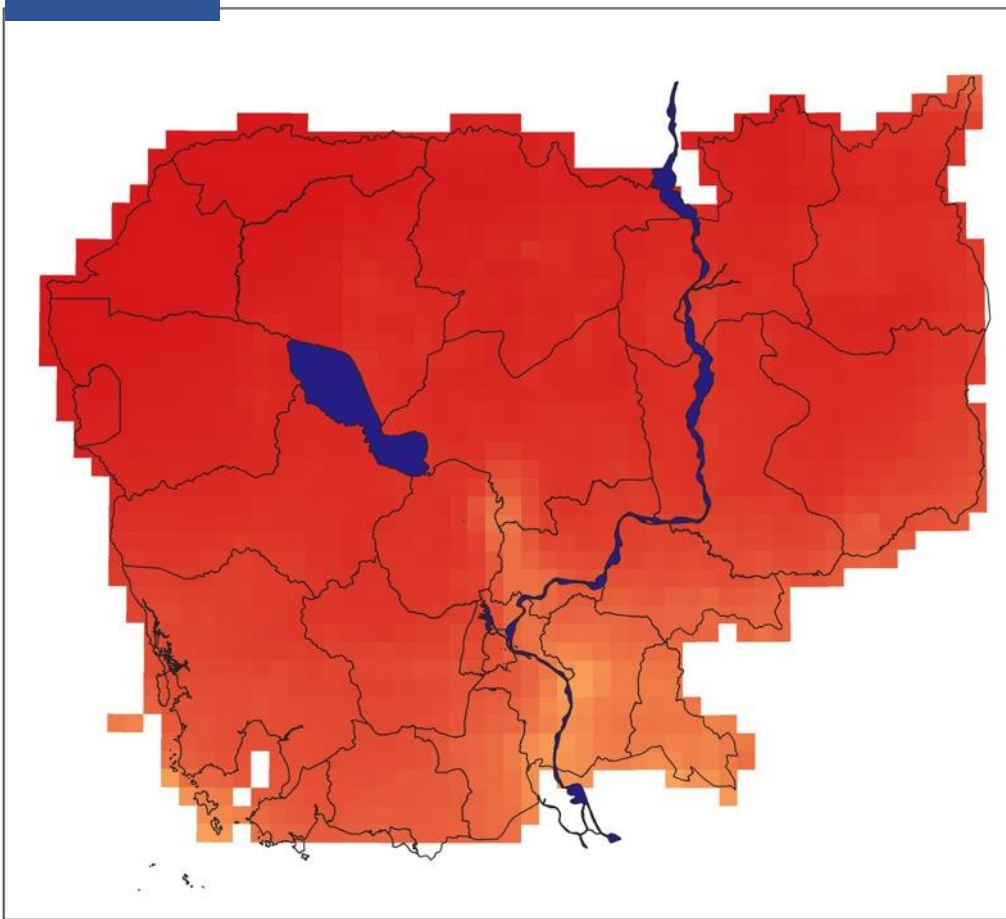


Climate Zone of Cambodia



Satellite based estimates – Monthly variation in rainfall and

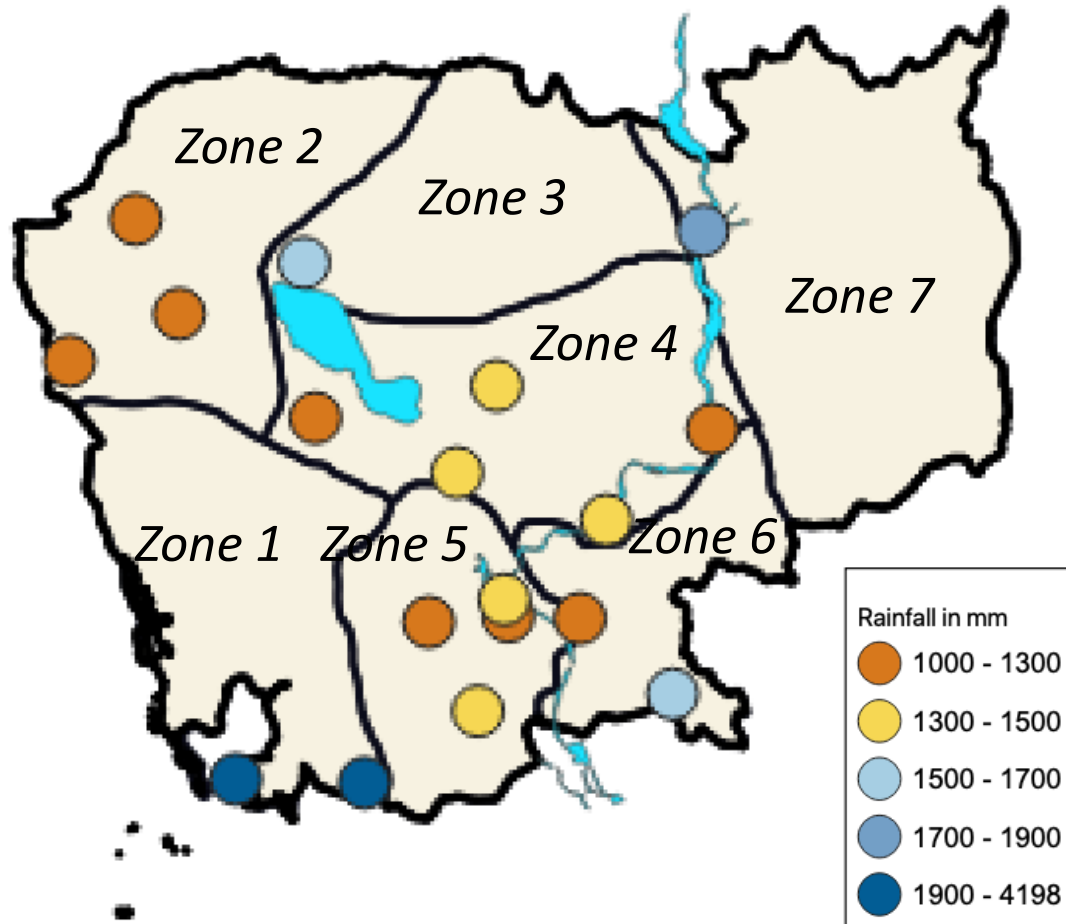
Dec



Climate Zone of Cambodia

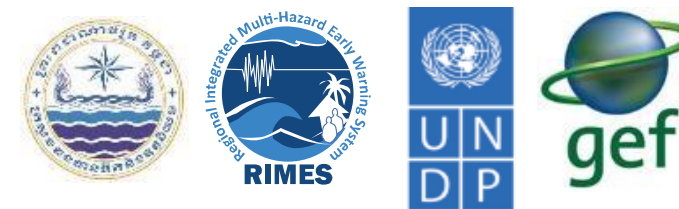


Climate Zone delineation



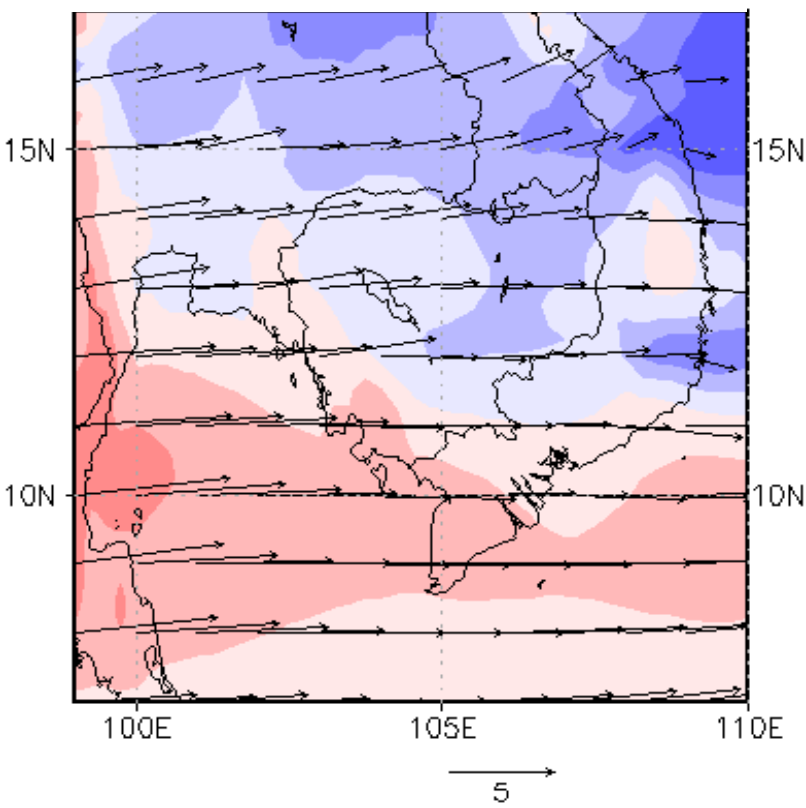
- **Characterization of climate using Surface observatory provides basis**
- **Satellite based estimates provides confirmation and the spatial extent of climate zones**
- **GIS used to digitize the zone boundaries**

Climate Zone of Cambodia

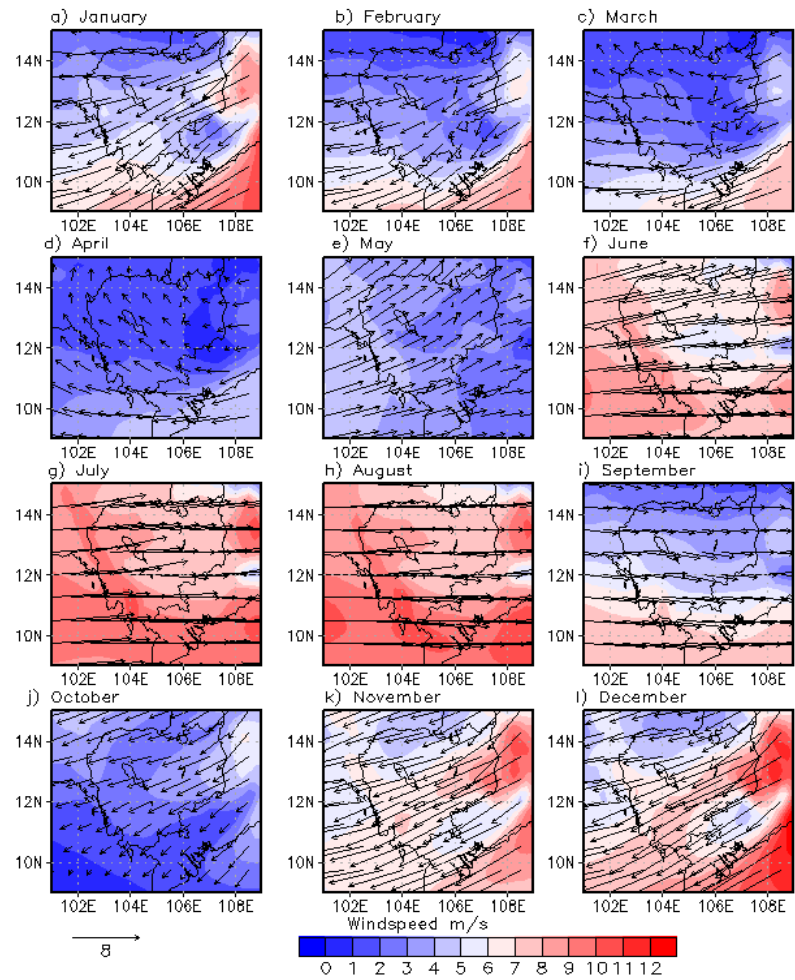
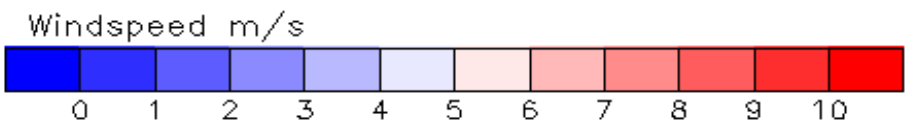
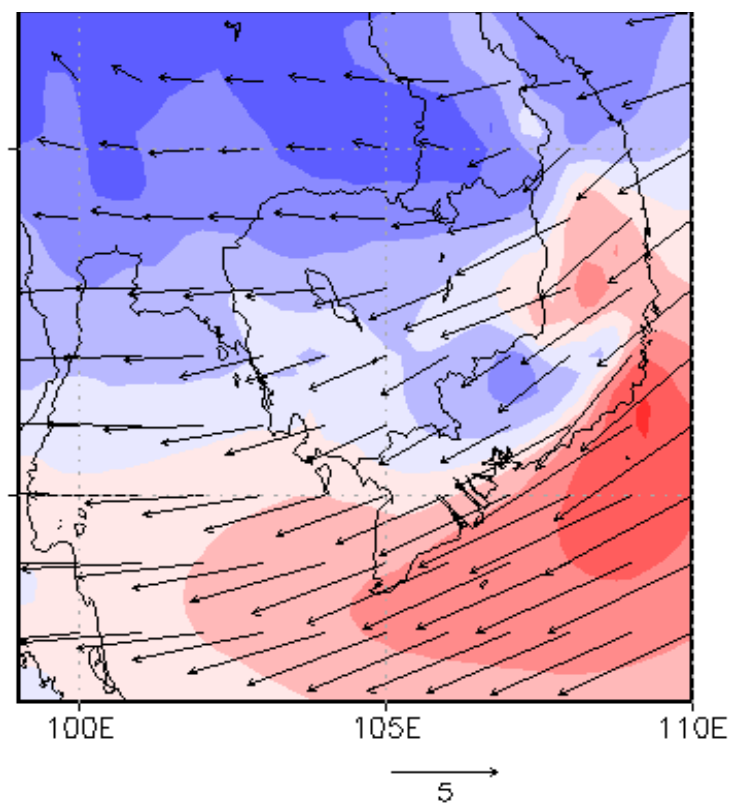


Climate drivers – Winds @ 1.5km above sea level

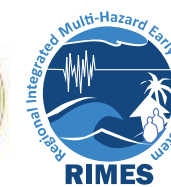
May to October



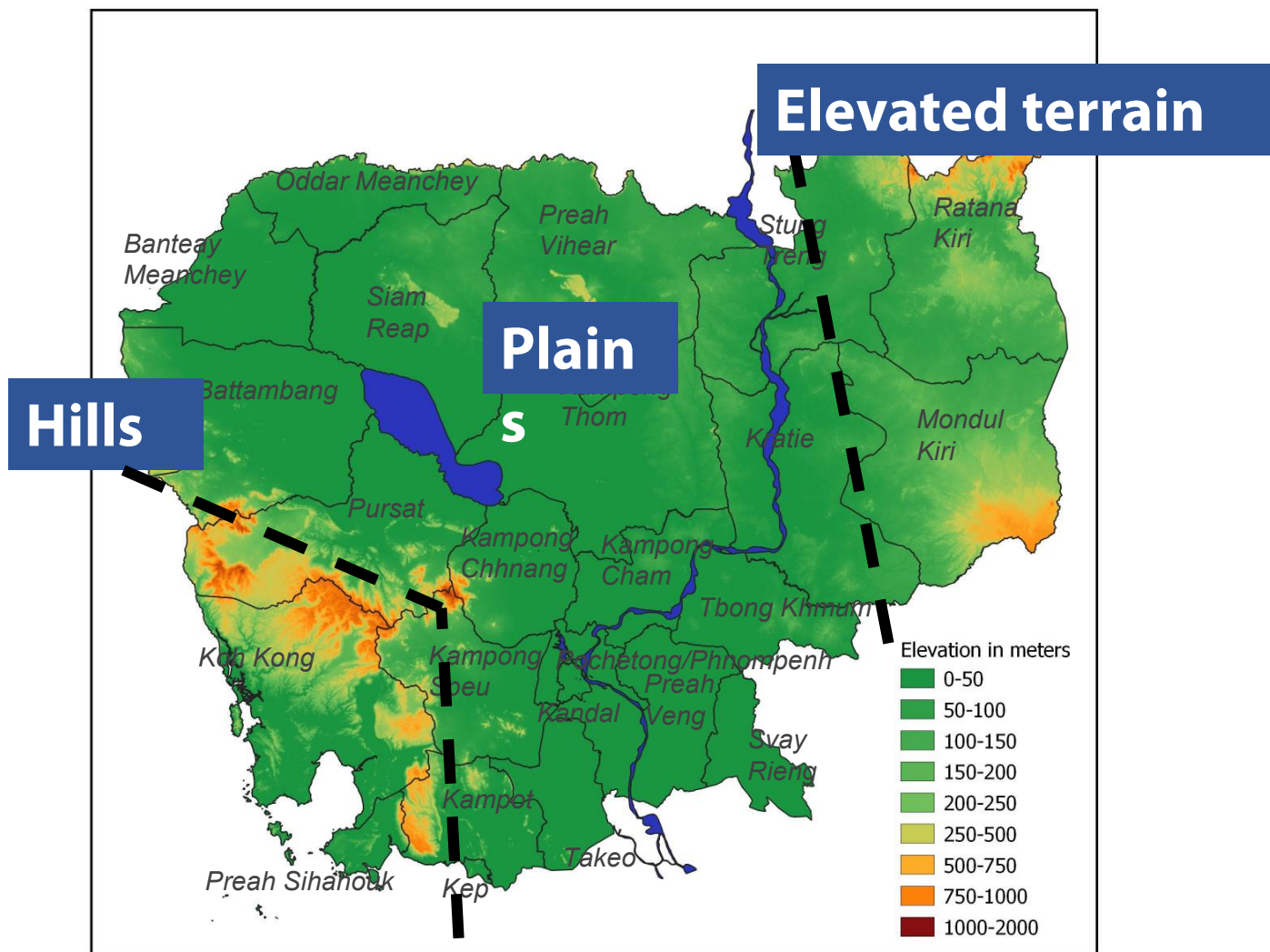
November to April



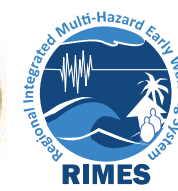
Climate Zone of Cambodia



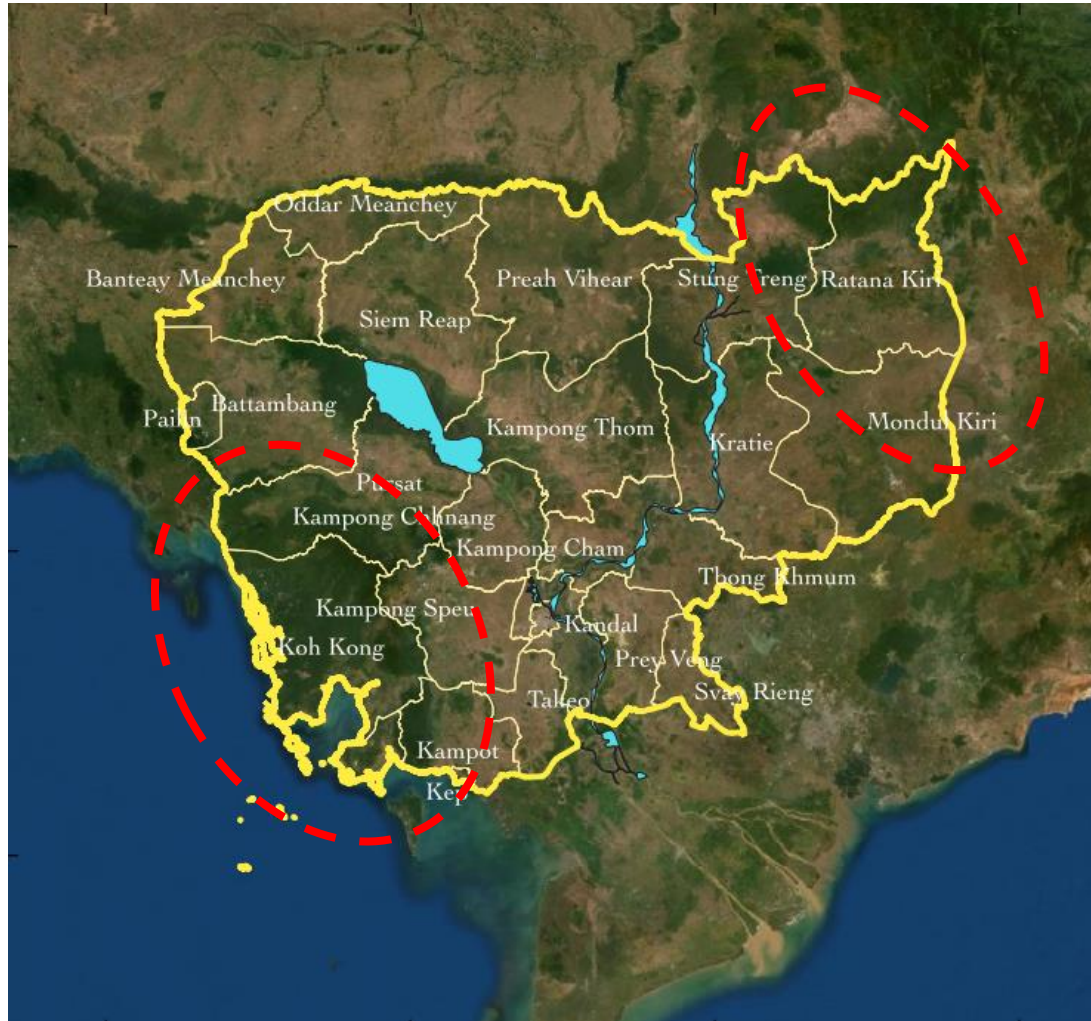
Climate drivers - Topography



Climate Zone of Cambodia



Climate drivers - Land Cover

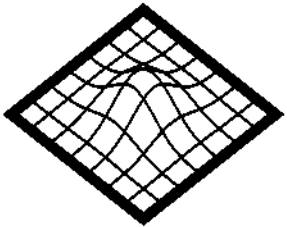




Climate drivers



Large Scale Drivers – Monsoon winds (southwesterly), Inter Tropical Convergence Zone movement

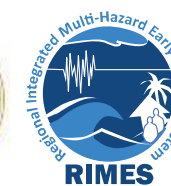


Topography – Hilly terrains over the South West influences rainfall over windward and leeward side of areas



Forest cover/Dense vegetation – Enhanced evapotranspiration could increase the moisture over atmosphere

Climate Zone of Cambodia



Application – Generating Seasonal Forecast by Climate Zones (FOCUS)

